EXERCISES IN MATERIA MEDICA AND PHARMACY

—

FISH

ELEMENTARY EXERCISES

FOR

STUDENTS

IN

MATERIA MEDICA AND PHARMACY

BY

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PREFACE TO THE SECOND EDITION

In this edition it has seemed desirable to cut out the taking of notes on a number of drugs, which were of more or less limited use in medicine. A few of the more important medicines, characterized by pronounced physiologic action on certain tissues were retained and charts were introduced so that the specific actions might, in a graphic way, be indicated upon them. More practical work, in the way of experiments, has also been introduced with the belief that the skill derived in the various manipulations will be of later service in the preparation of medicines in personal practice. Especially is this true in the case of veterinary practice; for many of the preparations required are not obtainable in the market as is the case in human medicine.

It has been the aim to emphasize the fact that first hand knowledge is best; to train the power of observation, and to cultivate skill and accuracy. Because he has seen and done the work, the student will hold the facts thus obtained much longer than when taken on the mere statement of text books.

As this manual is intended for a laboratory companion, blank pages have been inserted upon which the student may make notes of his observations as he proceeds or of additional facts brought out in the recitations.

But little originality can be claimed for this work; the writer has drawn freely from the standard and excellent works of Remington, Sollman, Fantus, Stewart, Coblentz and others.

P. A. F.

October 1, 1904.

APPARATUS IN STUDENT'S LOCKER

1 dozen 5 in. test tubes
1 dozen 6 in. test tubes
1 Minim pipette
1 Funnel, 1½ in.
1 Funnel, 3 in.
2 Beakers, 10 oz.
2 Flasks
1 Graduate, 30 cc.
1 Graduate, 250 cc.
1 Watch glass
1 Glass rod
2 Percolators
1 Test tube rack
1 Test tube brush
1 Test tube holder, wire
2 Evaporating dishes
2 Glass plates
1 Steel spatula
1 Horn spatula
1 Mortar and pestle
1 Sieve, 40 mesh
1 Sieve, 60 mesh
1 Thermometer
1 Copper water bath
1 Block metric weights
1 Package filter papers, 3 in.
1 Package filter papers, 6 in.
1 Piece absorbent cotton
1 Piece wire gauze
1 Box matches.
1 Towel
1 Sponge

Special apparatus, not found in the locker, may be obtained when needed, by handing an order for it to one of the assistants.

LABORATORY WORK IN MATERIA MEDICA AND PHARMACY

GENERAL DIRECTIONS

The work in this course will consist of the examination of specimens; testing drugs and their incompatibilities; making pharmaceutical preparations; taking notes and occasional demonstrations.

Unless otherwise directed as to quantity, just as small an amount of material as is necessary, is to be used in performing the experiments.

All apparatus used during the exercise must be cleaned and the table left in an orderly condition. The bottles, containing reagents for general use, must be left on their proper shelves and under no circumstances are they to be carried to individual desks.

With all specimens presented for examination note carefully: Odor; color; taste (except poisons); form (liquid or solid, crystalline, amorphous, etc.); deliquescent or effervescent; weight, whether comparatively heavy or not; solubility, use only a small amount of the substance in a test-tube and ten or fifteen times its bulk of distilled water and shake thoroughly, if the substance does not dissolve heat to the boiling point, if unsuccessful use alcohol in the same way, or an acid, or alkali, or chloroform; reaction, place a little of the substance in a clean test-tube, add a small amount of distilled water, heat gently and test the reaction with red or blue litmus paper.

In the case of solutions the darker should be added to the lighter fluid, at first adding only a drop or two, then more if necessary. Note any change that takes place before shaking the tube. If there is no apparent result, shake thoroughly. If a precipitate forms, note whether it increases in amount or redissolves as more of the liquid is added. State as well as you can whether the results are due to physical or chemical phenomena.

Copies of the following works will be found in the laboratory and the following abbreviations refer to them:

U. S. P.—United States Pharmacopoeia.

U. S. D.—United States Dispensatory.

N. D.—National Dispensatory.

P. Q. C.—Potter's Quiz Compend of Materia Medica.

S. P. C.—Stewart's Pharmacy Compend.

W. & W.—White and Wilcox Materia Medica.

Butler—Text Book of Materia Medica, and Therapeutics and Pharmacology.

Bruce—Materia Medica and Therapeutics.

In consulting the various articles on drugs make concise notes as far as possible, upon the following topics: External or local action; action upon the digestive system, circulatory system, nervous system, respiratory system, temperature, absorption, elimination; and general remarks.

The note books are to be handed in for inspection and must be written up to date.

DEFINITIONS

Drugs—(A. S. *drugan*, to dry.) A term formerly used to designate dried medicinal plants. The term is no longer restricted to its original meaning but includes remedial agents from the animal and mineral kingdoms as well as the vegetable. It includes all substances employed in the cure of disease.

Materia Medica—(L. *material of medicine*) is the study of medicines. It is a comprehensive term and may include the administration and action of drugs. It may be considered as subdivided into some of the following subjects:

Pharmacognosy—(Gr. *pharmakon*, a drug, and *gnosis* knowledge) refers to the study of the physical and chemic character of drugs.

Pharmacology—(Gr. *pharmakon*, a drug, *logos*, a discourse) treats of the action of chemic substances upon living tissues.

Pharmacodynamics—(Gr. *pharmakon*, a drug, *dunamis* power) relates to the physiologic action of drugs upon healthy individuals. Its meaning is so similar to that of pharmacology that the latter and broader term is now more generally used in preference.

Pharmacy—(Gr. *pharmakeia*, the use of drugs) the art of preserving, preparing, compounding and dispensing drugs in a form suitable for use as medicines.

Toxicology—(Gr. *toxikon*, a poison, *logos*, a discourse) is the science which treats of poisons.

Therapeutics—(Gr. *therapeuein*, to attend upon) includes all that relates to the alleviation or cure of disease.

Pharmacopoeia—(Gr. *pharmakon* drug, *poiein*, to make) is a book containing a list of medicinal substances, with descriptions, tests and formulae for preparing same, selected by some recognized authority.

In some countries the government authorizes the pharmacopœia and the work is therefore referred to as official. In the United States the government is not concerned ; a committee of representative physicians and pharmacists prepare the pharmacopœia and revise it every ten years. The preparations contained in it are generally referred to as official on the authority of the committee (not the government). The term officinal, formerly used, has now become practically obsolete in this connection.

A large number of useful unofficial formulas have been published with the authority of the American Pharmaceutical Association under the name of the *National Formulary*.

A Dispensatory is a commentary on a pharmacopœia. The pharmacopœia describes the drugs and chemic substances of the materia medica, establishes the degree of purity of many of them, and defines the strength of the preparations. The dispensatories comment on the substances, giving their physical, medical and pharmaceutic history, with their doses and uses. They also include many substances which are not found in the pharmacopœia and are not, therefore, official.

WEIGHTS AND MEASURES

Those most generally used by the physicians and pharmacists in the United States are the Troy or Apothecaries Weights, and the Wine or Apothecaries Measures. The Metric System, however, has been recognized to such a great extent that it has become a necessity for physicians to become familiar with it.

TROY OR APOTHECARIES WEIGHTS

Pound (*Libra*)		Ounce (*Uncia*)		Drachm (*Drachma*)		Scruple (*Scrupulum*)		Grain (*Granum*)
℔ 1	=	12	=	96	=	288	=	5760
		℥ 1	=	8	=	24	=	480
				ʒ 1	=	3	=	60
						℈ 1	=	gr. 20

WINE OR APOTHECARIES MEASURES

Gallon (*Congius*)		Pint (*Octarius*)		Fluidounce (*Fluiduncia*)		Fluidrachm (*Fluidrachma*)		Minim (*Minimum*)
Cong. 1	=	8	=	128	=	1024	=	61440
		O 1	=	16	=	128	=	7680
				f℥ 1	=	8	=	480
						f℈ 1	=	M. 60

AVOIRDUPOIS WEIGHTS

Pound (*Libra*)		Ounce (*Uncia*)		Grain (*Granum*)
lb 1	=	16	=	7000
		oz. 1	=	gr. $437\frac{1}{2}$

To avoid misapprehension in the use of the apothecary and avoirdupois systems, the symbols ℔, ℥, ʒ, ℈ should be consistently used for the apothecary, and the abbreviations lb, oz, gr, for the aviordupois. The abbreviation for the Troy pound is characterized by the cross line drawn through the letters ℔ and should always mean twelve ounces, while the avoirdupois pound stands for sixteen ounces. The symbol ℥ means an apothecarie's ounce of 480 grains, while "oz." means an avoirdupois ounce of $437\frac{1}{2}$ grains. The grain weight is the same for both systems and the abbreviation gr. will cause no confusion. The grain is, therefore, the unit in both systems and the term is derived from the old system of weighing, which required that there should be used a "grain of wheat, well dried and gathered out of the middle of the ear."

In using the metric system of weights the gram is ordinarily used as the standard and the other subdivisions are reckoned from it.

METRIC WEIGHTS

10 milligrams (mg.)	make 1 centigram	(cg.)
10 centigrams	make 1 decigram	(dg.)
10 decigrams	make 1 gram	(gm.)
1000 grams	make 1 kilogram	(kilo.)

METRIC MEASURES

1000 Cubic centimeters (cc.) (Milliliters) make 1 liter (L).

1 Gram equals the weight of 1 cc. of distilled water at a temperature of 4° C.

TABLE OF APPROXIMATELY EQUIVALENT WEIGHTS

1 milligram .001	=	$\frac{1}{64}$ grain
1 centigram .01	=	$\frac{1}{6}$ grain
1 decigram .1	=	$1\frac{1}{2}$ grains
1 gram	=	$15\frac{1}{2}$ grains
4 grams (3.9 gm.)	=	1 dram
31 grams (31.1 gm.)	=	1 ounce
500 grams (453.6 gm.)	=	1 pound (av.)
1 Kilogram	=	$2\frac{1}{5}$ pounds (av.)

$\frac{1}{64}$ grain	=	.001 gram
$\frac{1}{6}$ grain	=	.01 gram
1 grain	=	.065 gram

15.43 grains	=	1. gram
1 dram (apoth.)	=	3.90 grams
1 ounce (apoth.)	=	31.1 grams

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1 minim	=	.061 cc.
16 minims	=	1. cc.
1 fluidram	=	3.75 cc.
1 fluidounce	=	30. cc.

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1 cc.	=	16 minims
4 cc. (3.7 cc.)	=	1 fluidram
30 cc.	=	1 fluidounce

To convert grains into centigrams, multiply by 6.5. Thus 3 grains multiplied by 6.5 equals 19.5 centigrams, or 10 grains equals 65 centigrams or, .65 gram. To convert centigrams into grains divide by 6.5. Thus 26 centigrams divided by 6.5 equals 4 grains.

DOMESTIC MEASURES

A drop, *gutta*, (gtt.) is usually reckoned at about one minim.
A tea-spoonful is about one fluidram.
A table-spoonful is about one-half fluidounce.
A wine-glassful is about two fluidounces.
A tea-cupful is about five fluid ounces.
A breakfast-cupful is about eight fluidounces.
A tumblerful is about eight fluidounces.

Domestic measures vary considerably. There may be from 50 to 150 drops in a fluidram, a teaspoon generally holds more than 1 dram, even as much as 2 drams or more. Cups and glasses likewise vary widely.

PRESCRIPTION WRITING

The construction of a prescription is most important. It is a trying task for the beginner and considerable perseverance is required in order to write a prescription accurately and quickly. Some knowledge of Latin is imperative and a student without training in that language should make up his deficiency at the earliest opportunity. This may be accomplished in a fairly satisfactory manner by a thorough study of some one or more of the good manuals on prescription writing, where the essential rules, governing the case, gender, number, etc., of the Latin terms, are given sufficiently to enable one to grasp the fundamentals. Each student should procure such a manual. For practice, both apothecary and metric systems should be used. The prescription should be written out in one system and the equivalent amounts in the other. The decimal line is preferable to the decimal point in the metric prescription. Roman numerals are used to indicate the amounts in the apothecary, and Arabic in the metric. In transposing from one system to the other, it is approximately correct to consider 1 gram as equal to 15 grains ; 1 cc. to 15 minims ; 4 grams or 4 cc. to 1 dram and 6.5 centigrams to 1 grain.

One of the first essentials in the writing of the prescription is to determine the dose of each ingredient. The single dose is multiplied (mentally) by the number of doses to be taken, in order to get the total amount of the ingredient to be used in the prescription. The size of the dose will depend upon the age and sex of the patient, nature of the disease, etc. Liquid preparations, especially if there be any deposit, should be ordered shaken in order to insure an equal dosage.

The following is an example of a compound prescription with the method of calculating the dose (a simple prescription contains one ingredient ; a compound prescription contains more than one ingredient). The prescription may be used for the reduction of temperature. Having decided upon the number of doses which the patient is to receive, which in this case is fifteen, the quantity of each substance is multiplied by the number of doses :

Name of patient : A----------B----------.

Superscription : ℞

Inscription :

	APOTH.	METRIC	
Basis, Quininæ Sulphatis (6 grains each dose × 15)	= ℥iss	(grams)	6
Adjuvant, Spiritus Etheris nitrosi (32 minims each dose × 15)	= f℥i	(cc.)	30
Corrective, Syrupi Eriodictyi aromatici (12 minims each dose × 15)	= f℥iii	(cc.)	12
Vehicle, (sufficient to make each dose 1 f℥) aquæ q. s. ad	= f℥ii	(cc.)	60

Subscription :

Directions to the apothecary : misce.

Directions to the patient : Sig. Teaspoonful in some water every four hours.

Name of physician with date ;

J----------S----------, D.V.M. JAN. 1, 1905.

The dosage in the above prescription would be suitable for a man or a good sized dog ; for a horse 16 to 20 times as much may be used.

Incompatibilities must be considered. Always determine the reason for them if possible.

Chemic incompatibility is not always evident immediately or after the solution has stood for a time. There may occur a double decomposition, or a less soluble or more volatile compound may form, according to changes in temperature, agitation, exposure to light, etc. The incompatibility may often be indicated by the evolution of gas, change of color, precipitate, etc.

Pharmaceutic or Physical incompatibility depends chiefly upon the question of solvents and solubility, and usually occurs when solids or liquids are added to solutions, thereby changing their density, etc.

Physiologic or Therapeutic incompatibility depends upon the physiologic actions of the preparations administered and the size of their doses which may render the effects of each other negative.

Taking notes of the experiments is an integral part of the laboratory work and they should be written while the experiment is in progress or immediately afterward. The work outlined in each exercise should be carefully studied in advance.

For practical purposes, drugs may be divided into two groups: the inorganic and organic. The inorganic will be considered first. They may be sub-divided into: 1, non-metals and their combinations, and 2, the metals and their combinations.

EXERCISE I

Non-metals are electro-negative; they are attracted to the positive pole (*anions*) when electrolysis occurs.

Oxygen. In medicine this gas is generally used for inhalation. In veterinary practice it is used to distend the udder of the cow in cases of "Milk Fever." Oxygen is conveniently obtained in the metal cylinders with wash bottle attachment. The compounds which it forms with other bodies are termed oxides and are of considerable interest pharmaceutically.

Aqua. Water. Ordinary river, lake or spring water contains traces of salts and gases. Rain and snow water are purer. Water is the most common and useful solvent and has a wide application in medicine and pharmacy.

Aqua Destillata. The solid matter and traces of various salts are removed from ordinary water by distillation. It is used in medicine and pharmacy principally as a solvent for delicate chemical salts or for any purpose where ordinary water is unfitted. It is usually used in eye-washes.

Dissolve a crystal of silver nitrate in a little ordinary water and compare with a solution obtained by dissolving a crystal of the same salt in a little distilled water.

Aqua Hydrogenii Dioxidi. Solution of Hydrogen Dioxide or Peroxide. An odorless aqueous solution containing 3 % by weight of Hydrogen Dioxide (H_2O_2). The solution is liable to decomposition and should be kept in a cool place. It is a powerful oxidizer, but deteriorates on keeping. Its value depends upon the amount of oxyen it can set free. It is incompatible with most other substances.

Note the appearance, odor and taste of the specimen. Test its reaction with litmus. Mix with a little water, also with a little alcohol. Add a small portion to a little saliva. Place a few drops upon a piece of filter paper previously moistened with a solution of potassium iodide and starch. Mix another portion with a small amount of a solution of potassium permanganate acidified with sulphuric acid.

INORGANIC ACIDS

These acids are among the most important combinations of the non-metals. Three properties distinguish them from other bodies: 1, They act on litmus and other vegetable substances, changing their color. 2, Those soluble in water have a characteristic sour taste. 3, All contain the hydrogen ion and may be called hydrogen salts. The hydrogen is capable of being replaced by metals to form salts.

The term "ion" is the present participle of the Greek verb *ienai*, go. When an electric current is passed through the solution, the particles go to the electrodes. An ion cannot exist in a free state; it must always be connected with another ion bearing an opposite electric charge. Ions *go* to the electrodes because they are naturally charged with electricity, differing

in this way from the corresponding molecules which are uncharged. When an electric current is passed through the solution, the positively charged ion goes to the negative pole (cathode) and is called *cation*. The negatively charged ion goes to the positive pole (anode) and is therefore called *anion;* opposite charges attract, like repel. At the electrode, each ion loses its electric charge by neutralization of its electrictity, and is converted into its elementary condition. The term *etectrolysis* refers to the decomposition of a chemical compound by the passage of an electric current through it. A compound decomposable by an electric current is called by some an *electrolyte.*

The inorganic acids are divided into : *Hydracids*, those not containing O, derived from non-metallic elements, *e. g.*, HCl, HBr. *Oxyacids*, from non-metallic elements. They contain oxygen, *e. g.*, HNO_3, H_2SO_4. *Anhydrides*, are commonly included with the acids. They constitute a class of *acid-forming oxides*, erroneously termed acids—such as arsenous acid, chromic acid, carbonic acid &c. The suffixes *ic* (L. *icum*) and *ous* (L. *osum*) are used as terminations to the names of acids containing O. The former denoting a higher amount and the latter a lower proportion of O. *e. g.*, Sulphur*ic* acid, H_2SO_4 contains more O than sulpur*ous* acid, H_2SO_3. Still higher or lower proportions are designated by the prefixes *per* and *hypo* attached respectively to the name of the *ic* or *ous* acid.

Many of the official inorganic acids are solutions of gases in water. The amount of gas in solution varying in the stronger acids. *e. g.*, Acidum Hydrochloricum contains 31.9 %. Acidum Nitricum, 68 %. Acidum Sulphuricum 92.5 %. Acidum Phosphoricum 85 %. The *dilute* acids contain uniformly 10 % of the absolute acid, except acetic (6 %) and hydrocyanic (2 %).

CHLORINE, BROMINE AND IODINE

Chlorine, bromine and iodine are halogens (salt producers). Chlorine is a greenish-yellow, gaseous body, having a very suffocating odor. It is a strong oxidizer ; it unites with elements directly and is very irritant to the air passages.

Prepare a little chlorine water by placing a little manganese dioxide in a gas generating apparatus, cover it with hydrochloric acid (4 parts) and shake well. Arrange

so that the delivery tube will reach to the bottom of a test tube containing 30 cc. of cold water. Assist the generation of gas by slightly heating the flask. When 40 bubbles of gas have passed over, and the gas ceases to be absorbed, disconnect the apparatus. Preserve the chlorine water thus prepared in an ounce bottle and label *aqua chlori.* Note its appearance, odor, taste and chemical reaction. The generator should be quickly and thoroughly cleaned. Official chlorine water should contain 0.4 % of the gas. It should be kept from the light, as it undergoes decomposition and some HCl is formed.

Calx Chlorata. Chlorinated lime improperly called "Chloride of lime." Its common name is "bleaching powder." Chlorinated lime is a loose compound of chlorine and slaked lime and should contain at least 35 % of available chlorine. It is used for disinfecting and bleaching purposes. Its efficiency depends upon the available chlorine.

Make a solution of chlorinated lime ; filter. Add to the filtrate a solution of sodium carbonate. Note result and filter again. The product thus obtained if made so as to contain 2.6 % of available chlorine is the official *Liquor Sodae Chloratae*, Solution of chlorinated soda or Labarraque's Solution.

Eau de Javelle (Javelle water) is a French preparation made as above but substituting potassium carbonate for the sodium salt.

Bromum. Bromine is a dark brownish-red, mobile liquid, at ordinary temperature evolving a yellowish-red vapor highly irritating to the eyes and lungs. It is only slightly soluble in water, but readily dissolves in alcohol and ether.

Add some chlorine water to a strong solution of potassium bromide. Bromine should be liberated and may be dissolved in a little ether, add a few drops of concentrated sulphuric acid to some crystals of potassium bromide, reddish vapors of bromine are evolved.

Iodum. Iodine. Note the appearance and odor. Test its solubility in water, alcohol and in a solution of potassium iodide.

Tinctura Iodi is a 7 % solution of iodine in alcohol. Take 3.5 grams of iodine and add enough alcohol to

measure 50 cc. When completely dissolved add a few drops to some water and note result.

Liquor Iodi Compositus Lugol' Solution. Make the solution as follows :

Iodine	2.5 grams.
Potassium Iodide	5. grams.
Distilled Water q. s.	50. cc.

Place the iodine and potassium iodide in a 2 oz bottle and add enough of the water to make 50 cc. Apply a little of the iodine solution to the skin of the hand. The stain may be removed by the application of any reducing agent as sodium hyposulphite or ammonium or other hydroxide.

Amylum Iodatum. Iodized starch. Triturate 2.5 grams of iodine in a small quantity of water. Add 47.5 grams of starch in small quantities and carefully triturate nntil the mass is of a uniformly blue black color. The product should be allowed to dry slowly, not over a temperature of 40°C.

EXERCISE II

Sulphur. Roll sulphur (brimstone) is prepared by fusing crude sulphur, allowing it to stand, to separate impurities and then pouring into cylindrical moulds. Three forms are official : *Sublimed*, *washed* and *precipitated* sulphur.

Sulphur Sublimatum. Flowers of Sulphur.

Place in a suitable tube a small piece of sulphur and heat gently. The sulphur will first melt, then be converted into a gas which will condense in the upper and cooler portion of the tube. This process is known as sublimation and is used in the preparation of some important pharmaceutic substances.

Sulphur Lotum. Washed Sulphur. This is made by washing sublimed sulphur with water containing ammonia and then with pure water, to rid it of sulphuric acid and other impurities. It is preferred in medicine because of its greater purity.

Sulphur Precipitatum. Precipitated Sulphur. A very fine, yellowish-white, amorphous powder, odorless and almost tasteless, made by precipitating a solution of calcium disulphide with hydrochloric acid.

Sulphuris Iodidum. Iodide of Sulphur. Also known as subiodide of sulphur. A grayish-black solid, generally in pieces, having a radiated, crystalline appearance, with a characteristic odor of iodine. It has a faintly acid reaction. There are some doubts as to its being a definite chemical compound.

Weigh out 1 gram of sulphur and 4 grams of iodine. Triturate thoroughly in a mortar. Introduce the powder into a test tube; close the orifice loosely and heat in a water bath gradually with occasional agitation. The temperature should not exceed 60°C at first until the ingredients combine and become of a uniformly dark color throughout. Then increase the heat to the boiling point of the water so as to fuse the mass. After cooling, break the tube and remove the contents. Break the product into pieces of suitable size and keep in a glass stoppered bottle in a cool place.

Unguentum Sulphuris Iodidi. Ointment of Sulphur iodide.

Sulphur iodide	1 gram
Lard	15 grams

Triturate the Sulphur iodide in a mortar until it is reduced to a fine powder. Add the lard in small quantities thoroughly rubbing the mass after each addition.

Phosphorous. A translucent, nearly colorless, volatile solid, having at the ordinary temperature, about the consistence of beeswax, and with a distinctive disagreeable odor and taste. It has a great affinity for oxygen, with which it combines on exposure to the air. It is sparingly soluble in absolute alcohol, a 0.12 % solution of which forms the official *spiritus phosphori*, which is used in the preparation of the *elixir phosphori*, each 4 c.c. of which contains 1 mg. of phosphorus. It is more soluble in oil, and a 1 % solution in almond oil forms the official *oleum phosphoratum*. As phosphorous is a powerful reducing agent, its preparations are incompatible with many substances.

EXERCISE III

Carbon. Carbon is a constituent of all organic substances. The two oxides of carbon and their corresponding acids are, Carbon dioxide, CO_2, and Carbonic acid, H_2CO_3, Carbon Monoxide, CO, which is of little interest in pharmacy. There are three forms of carbon official.

Carbo Animalis. Animal charcoal. (Bone or Ivory Black.) This preparation is made by subjecting bones to a red heat in close vessels. The volatile portions are driven off, carbon, mixed with mineral salts, being left.

Carbo Animalis Purificatus. Purified Animal Charcoal. This is Animal coarcoal purified from its calcium salts with hydrochloric acid.

Carbo Ligni. Charcoal. Prepared by burning wood without contact with the air.

Charcoal has great porosity, from which fact it has considerable power in absorbing, collecting and condensing substances from the surrounding medium. It therefore serves as a deodorant, decolorant and absorbent. Its principal use in medicine is an absorbent and disinfectant. It should never be left exposed to the air as its absorbent properties are soon lost. This condition, however, may be remedied by heating the charcoal before use.

> Dissolve 0.1 gram of quinine sulphate in 4 cc. of water, hastening the solution by the addition of a few drops of sulphuric acid. Note the fluorescence. Take one-half of the solution and shake with a little charcoal and filter. Compare the two solutions now as to fluorescence and taste.

Boron. Boron combines with hydrogen and oxygen, and boric (or boracic) acid is produced H_3BO_3, the principal salt of which is Sodii Boras, or borax.

> Make a hot saturated solution of borax in about 2 cc. of water and add ten drops of hydrochloric acid, and let the mixture cool. Boric acid is precipitated in white shining scales.

Silicon. Silicon is found in combination with aluminum, magnesium and calcium, in pumice stone, meerschaum, asbestos, talcum, soapstone, etc., and as an anhydride (silica) in sand, flint, agate, quartz, etc.

Liquor Sodii Silicatis. Solution of Sodium Silicate or *Soluble glass* This is made by fusing 1 part of fine sand (silica) with two parts of dried sodium carbonate, and dissolving the product. The solution is used in surgery in preparing mechanical dressings.

Saturate a piece of cloth or filter paper in the solution provided and allow to dry.

EXERCISE IV

METALS AND THEIR COMBINATIONS

Metals have a peculiar luster. They are good conductors of heat and electricity, and are capable of forming elementary cations. The oxides and hydrates of all metals are insoluble except those of the alkali metals, and of the alkine earth metals—the latter sparingly. The soluble oxides, when brought in contact with water, form hydrates which are known as *alkalies*.

The alkaline metals are potassium, sodium and lithium. They are characterized, 1 by their silvery white appearance ; 2, softness ; 3, powerful affinity for oxygen ; 4, lightness, being lighter than water, on which they float and take fire spontaneously, owing to their power of decomposing that fluid. They are all univalent. Ammonium is a compound radical, consisting of NH_4, but, owing to its many analogies with the alkali metals, is classed with them.

Alkalies. Alkalies are distinguished by the following characteristics : 1 a characteristic taste and if concentrated caustic. 2, They restore the color of reddened litmus. 3, They contain the hydroxyl (OH)-ion, and might be called salts of hydroxyl. They combine with acids to form salts.

The neutralization of an acid by an alkali consists essentially in the union of the H- and the OH-ions to form water.

The alkali metals, *potassium*, *sodium*, *ammonium*, *and lithium* are noted for the fact that all their ordinary salts are soluble, except potassium bitartrate and lithium carbonate, which are only sparingly soluble.

Care should be taken to distinuguish between the names of the metals, which end in *um*, and the hydrates which end in *a*.

Potassa. (Potassium Hydrate, Caustic Potash.)

Place a little potassa in an evaporating dish, exposed to the air. After a time it will liquefy (deliquesce). Potassa is quite strongly caustic and rapidly destroys organic tissue. It is, perhaps, more commonly used in veterinary than human practice.

Make a dilute solution of potassa. Test with litmus paper. Taste a little of the solution. Add gradually some dilute hydrochloric acid, testing with litmus, until the mixture just turns the litmus red. Evaporate to dryness. The product is a *salt*. Taste it. The alkaline taste of the OH-ions, and the acid taste of the H-ions, has disappeared; the salty taste common to the halogen ions appears.

To solutions of alum, copper sulphate, and zinc sulphate, add some solution of potassa and note results.

In an excess of a concentrated solution of tartaric acid, add, a drop at a time, some strong solution of potassa. Potasiium tartrate (cream of tartar) is formed. Does the precipitate redissolve?

Soda. (Sodium Hydrate. Caustic Soda.)

The sodium salts, as a rule, are more frequently used than the potassium, because they are relatively cheaper and are often more soluble.

Repeat the last experiment, substituting a solution of soda for potassa.

Lithium. The lithium salts resemble those of potassium and sodium. The metal lithium is much less prone to oxidation than potassium and sodium; it is soft and is the lightest of known metals, having a specific gravity of 0.5891.

Ammonium. Although the metal ammonium has not yet been isolated in the free state, its salts resemble those of the alkali metals so closely that they are usually considered in the same group.

Aqua Ammonia. Ammonia water is a 10 % aqueous solution of NH_3 by weight. *Aqua Ammoniae fortior*, stronger Ammonia water, contains 28 % by weight of the gas.

Dip a glass rod in some strong hydrochloric acid and hold it over some ammonia water. Note the white cloud that forms from the vapor.

Add some hydrochloric acid to ammonia water until the latter is neutralized. Evaporate to dryness with a gentle heat and stir constantly. The granular salt that remains is ammonium chloride. Note its taste.

Add some ammonia to a solution of corrosive sublimate. The precipitate is ammoniated mercury.

EXERCISE V

The Alkaline Earth Metals. *Magnesium, Calcium. Strontium and Barium.* The oxides of these earth metals, although only slightly soluble, resemble those of the alkali metals with the formation of a hydrate of alkaline properties. They differ from the alkali metals by forming insoluble carbonates and phosphates.

Magnesia. (Light Magnesia. Calcined Magnesia.)

Note the odor, taste, and solubility. Test chemical reaction. Add 1 part of magnesia to 15 parts of water in a beaker. This forms the *milk of magnesia.* Allow the mixture to stand for half an hour. A gelatinous hydrate forms. Add 4 parts of water to some milk of magnesia. Dilute with an equal amount of water some solution of ferric sulphate. (*Liquor ferri tersulphatis.*) Add this to the diluted milk of magnesia. The product is *Ferri oxidum hydratum cum magnesia*,—Ferric hydrate with magnesia ; the antidote for poisoning by arsenic.

Magnesia Ponderosa. Heavy Magnesia. A white, dense and very fine powder, corresponding, in all other properties and reactions, with magnesia. Heavy Magnesia, on account of its density, often permits the decrease in bulk of the dose in the ratio of nearly four to one.

Calx. Lime, or calcium oxide, is a very important alkaline earth.

To 30 grams of lime add 15 cc. of water, calcium hydrate or slaked lime results. To this slaked lime add 6 or 8 volumes of water. This forms milk of lime. Mix 60 cc. of the milk of lime with 600 cc. of water. Allow the lime to settle ; pour off the supernatant fluid and throw it away.

Now add some distilled water (300 cc.) to the lime ; shake thoroughly ; allow it to settle, or filter after a time and the product then represents *Liquor Calcis*, solution of lime or lime water.

Heat a little of the lime water and allow it to cool again. Lime is more soluble in cold than in hot water. Lime water is a saturated solution and contains usually about 0.17 % of calcium hydrate.

Linimentum Calcis. Lime liniment, sometimes called Carron Oil.

Mix 30 cc. of lime water with 30 cc. of linseed oil. This liniment is used largely as an external application for burns. In veterinary practice it is sometimes used internally for diarrhoea.

Lotio Flava. Yellow lotion or wash.

Dissolve 0.3 gram of corrosive chloride of mercury in 3.5 cc. of boiling water. Add enough lime water to this mixture to make 100 cc.

Lotio Nigra. Black lotion or wash.

Triturate 0.75 gram of mild chloride of mercury (calomel) in 3.5 cc. of water. Gradually add enough lime water to make a total of 100 cc.

Syrupus Calcis. Syrup of Lime.

Boil 3.25 grams of lime and 20 grams of sugar in 25 cc. of water, and add sufficient water to make a total of 50 cc. Lime forms soluble saccharates with sugar and is more soluble in syrup than in water.

EXERCISE VI

Salts. The product formed by the union of an acid radicle with a base is termed a salt. This term is applied more especially to solid substances assuming a crystalline form.

Salts may be neutral, acid, or alkaline according to the relative strength of the components. Those formed by the interaction of a strong acid and a strong base are of neutral reaction *e. g.* KCl. A weak base combined with a strong acid forms a salt of acid reaction *e. g.* Fe_2Cl_6. A strong base and a weak acid form a salt with alkaline reaction *e. g.* K_2CO_3. The knowledge

of the reaction of the salts is important from the fact that salts the with an acid reaction have incompatibilities of acids ; salts with an alkaline reaction those of the alkalies.

Binary compounds (compounds of elements) end in *ide*. For example the union of zinc with phosphorus forms zinc phosphide. Salts ending in *ate* are formed by the union of an acid ending in *ic* with a base, *e. g*. iron and sulphuric acid forms iron sulphate. Salts end in *ite* are formed by the union of an acid ending in *ous* with a base, *e. g*. sodium sulphite, sodium and sulphurous acid.

Salts of the Alkali Metals. (1) Neutral reaction, sometimes faintly alkaline. These salts are very soluble in water. In alcohol the iodides are relatively most soluble and the chlorides the least. The chlorates, nitrates and sulphates are mostly fairly soluble in water ; they are practically insoluble in alcohol. The chlorates and nitrates are oxidizing agents.

Add a small portion of a concentrated solution of potassium chlorate to a little alcohol.

Mix a minute quantity (a grain or less) of powdered potassium chlorate with the same quantity of powdered sugar in an evaporating dish, and heat gently. An explosive combustion will occur, [Oxidizing agents, chlorates, nitrates, etc., should never be mixed dry with reducing agents (organic substances) unless explosions are desired.]

To a solution of potassium iodide, add a little solution of potassium chlorate (or nitrate). The poisonous iodate will be formed, although no apparent change occurs. Upon the addition of an acid iodine is liberated. If taken internally the same change would occur in the stomach, and the liberated iodine would cause considerable irritation.

Experiments with reducing agents :

To a minute quantity (1 grain or less) of powdered potassium chlorate in an evaporating dish add a similar quantity of powdered sodium hypophosphite and note result.

To a solution of mercuric chloride add a solution of sodium hypophosphite.

To a solution of iodine add some sodium hyposulphite until the color changes.

Salts of vegetable acids are of a neutral or faintly alkaline

reaction and are freely soluble in water. The acetates are soluble in alcohol ; the citrates and tartrates are not.

(2) Alkaline reaction. The alkaline salts are incompatible with acids, alkaloids, and solutions of the salts of other metals. The carbonates are soluble in water but are insoluble in alcohol.

(3) Acid reaction. Potasii Bitartras, Potassium Bitartrate (Cream of Tartar) is an example. Note its appearance, odor, taste, solubility and chemical reaction.

Solutions of salts of vegetable acids are made by neutralizing a solution of a vegetable acid with an alkaline carbonate.

Liquor Ammonii Acetatis. Solution of ammonium acetate. (Spirit of mindererus). Add 1 gram of Ammonium Carbonate (translucent pieces free from white bicarbonate) gradually to 20 cc. of diluted acetic acid, and stir until it is dissolved. It is better to dispense the solution when freshly made as the presence of some free carbonic acid is desirable.

Liquor Potasii Citratis. Solution of potassium citrate. Dissolve 4 grams af Potassium bicarbonate in 20 cc. of water. Dissolve 3 grams of citric acid in 20 cc. of water. Filter the solutions separately and wash the filters with enough water to obtain, in each case, 25 cc. Finally mix the two solutions, and, when effervescence has nearly ceased, transfer the mixture to a bottle.

Pulvis Effervescens Compositus. Compound Effervescing Powder. (Seidlitz Powder).

Sodium Bicarbonate, powdered	2.5 grams
Potassium and Sodium Tartrate, powdered	7.7 grams
Tartaric Acid, powdered	2.2 grams

Mix the sodium bicarbonate intimately with the potassium and sodium tartrate and wrap in a blue or yellow paper. Wrap the tartaric acid in a white paper. The two powders are mixed in a half tumblerful of water, which is taken while effervescing.

EXERCISE VII

Salts of the Alkaline Earth Metals. These salts are incompatible with fixed alkali hydrates, carbonates, phosphates, sulphates (except in case of Mg.), oxalates, and tartrates.

Magnesii Carbonas. This salt exists in two forms, the light and heavy.

Prepare some of the *light* variety by mixing dilute solutions, in the cold, of magnesium sulphate and sodium carbonate.

Prepare some of the *heavy*, by mixing hot concentrated solutions of the same salts.

These preparations furnish a good illustration of the rule in precipitation, that dilute solutions produce light precipitates, and dense solutions heavy precipitates.

Calcii Carbonas Precipitatus. Precipitated Chalk. Take of Chloride of Calcium 5 grams; Carbonate of Soda 13 grams; boiling distilled water a sufficiency. Dissolve the chloride of calcium and the carbonate of soda each in 32 cc. of the water; mix the two solutions; and allow the precipitate to subside. The product may be further purified by collecting the precipitate upon a filter, washing it with boiling distilled water until the washings cease to give a precipitate with a solution of nitrate of silver, and the product dried at a temperature of 100° C.

Pulvis Cretae Compositus. Compound Chalk Powder. This preparation is made by mixing 7.5 grams of powdered chalk with 5 grams of powdered acacia and 12.5 grams of powdered sugar. It is used for making chalk mixture.

The Earth Metals. Aluminum and Cerium are the only earth metals furnishing official preparations.

Alumen. Alum, (Potassium Alum. Aluminum and Potassium Sulphate). The name of the metal (aluminum) should be distinguished from that of the double sulphate *alumen*, (alum).

Note the appearance, odor, taste, solubility and reaction of alum.

Place a weighed piece (10 grams) of alum in an evaporation dish and heat until it liquefies. Then continue the application of heat with constant stirring until the aqueous vapor (water crystallization) ceases to be disengaged and a dry porous mass is obtained. *Alumen Exsiccatum*. Weigh again.

To a solution of albumin add a small amount of a solution of alum.

To a solution of carmine add a little of a strong solution of alum and then some ammonia. Aluminum hydroxide is precipitated carrying the coloring matter with it. Precipitants of this kind are known as *lakes*.

EXERCISE VIII

Heavy Metals. Most of the heavy metals are comparatively weak bases and have a tendency to form basic salts. Many of their salts are colored and many are quite insoluble. The taste of the soluble salts is generally "metallic," a mixture of bitter, salt and astringent. An important characteristic of salts of the heavy metals is their property of forming precipitates with proteids (albumin), a property upon which their local medicinal action largely depends.

Zinci Sulphas. Zinc Sulphate (White Vitriol). This is the more commonly used of the zinc salts. Note the appearance, odor, taste, solubility and reaction.

Mix a little of the zinc sulphate solution with a solution of albumin.

To a solution of zinc sulphate add some solution of sodium carbonate. The precipitate is *Zinci Carbonas Precipitatus* Precipitated Zinc Carbonate.

Cupri Sulphas. Copper sulphate. (Blue Vitriol. Blue Stone). This is the only official salt of copper. Note the appearance, odor, taste, solubility and reaction. Add a little copper sulphate solution to a solution of albumin.

Plumbi Oxidum. Lead Oxide, (Litharge). Note its appearance, odor, taste and solubility. Try its solubility in some dilute nitric acid and use the solution of lead nitrate in the following experiments :

To some of the lead nitrate solution add some solution of sodium carbonate. The precipitate is *Plumbi Carbonas*, Lead carbonate (white lead).

To another portion of the lead nitrate solution add potassium iodide solution. The precipitate is *Plumbi iodidum*. Lead iodide.

Plumbi Acetas. Lead acetate, (Sugar of Lead). Note its solubility. If the solution is turbid it is due to

the formation of a trace of carbonate on account of the carbonic acid present in the water. The turbidity may be removed by the addition of a little acetic acid.

Liquor Plumbi Subacetatis. (Goulard's extract.) Dissolve 17 grams of lead acetate in 80 cc. of distilled water, in an evaporating dish. Then add 10 grams of lead oxide previously passed through a fine sieve, and boil for a half an hour, occasionally adding hot distilled water to make up the loss by evaporation. Remove the heat, allow the liquid to cool, and add enough distilled water, previously boiled and cooled, to make the product measure 100 cc. Filter the liquid in a closely-covered funnel and keep in well-stoppered bottles. The preparation should contain about 25% of lead subacetate.

The solution is sedative and astringent and is employed externally as an application to inflamed surfaces.

Liquor Plumbi Subacetatis Dilutus. (Lead water, Goulard's lotion). Mix 3 cc. of the solution of lead subacetate with enough distilled water, previously boiled and cooled, to make the product measure 100 cc. Keep in well stoppered bottles.

Hydrargyrum. Mercury, (Quicksilver). Mercury is the only metal liquid at ordinary temperature. It is slowly volatile insoluble except in nitric acid. In the free state it is without medicinal action ; but minute subdivision favors its oxidation and solution in the juices of the tissues, and it thus becomes active medicinally, as in gray powder, blue mass, etc.

To a little mercuric chloride solution add a drop of potassium iodide solution. A scarlet precipitate of mercuric iodide is formed. Add several more drops of the potassium iodide solution until the mercuric iodide redissolves because of the production of a double salt $(KI)_2HgI_2$. A clear liquid will be formed known as "Mayer's Reagent," which precipitates nearly all alkaloids from solution of their salts. Mercuric chloride is almost universally incompatible.

Add a little mercurous chloride (calomel) to a solution of potassium iodide. Yellow mercurous iodide is formed, which is further decomposed into metallic mercury and *mercuric* iodide. The latter combines with the potassium

iodide in solution to form Mayers' reagent. Filter. The filtrate precipitates alkaloids. Test this by adding a little of the filtrate to a solution of quinine sulphate. All oxidizing agents are incompatible with mercurous salts as the more poisonous mercuric salt is formed.

Argenti Nitras. Silver Nitrate. When silver nitrate is heated and the water of crystallization driven off, it becomes fused. While still warm it may be moulded into pencils and is then known as *Argenti nitras fusus* (Lunar caustic). If the silver nitrate be fused with twice its quantity of potassium nitrate it is known as *Argenti nitras dilutus* (mitigated caustic).

Rub a little moistened silver nitrate upon the skin of the hand. Note that a black stain is produced after a time. To remove the stain, apply a little tincture of iodine followed by ammonia or sodium hyposulphite.

To a little glycerine add a small amount of a solution of silver nitrate. After a time the mixture darkens on account of the reduction of the silver nitrate. Other reducing agents act similarly. Silver nitrate is quite generally incompatible.

Ferrum. Iron. The number of official iron salts is very large ; in addition there are a great many unofficial preparations used in medicine. Ferrous salts are mostly green in color and are reducing agents. Ferric salts (except phosphate) are red, and the "ic" compounds may act as oxidizing agents. The iron salts are incompatible in the form of a *precipitate* with soluble hydrates, carbonates, phosphates, borates, sulphides, ferrocyanides, ferricyanides, tannic acid, gallic acid. Alkaline citrates and sugar dissolve many insoluble salts of iron. Many ferric salts precipitate albumin and gelatinize mucilage of acacia. Incompatibility by *oxidation* or *reduction* is shown by the two classes of the salts. Ferrous salts are incompatible with oxidizing agents ; ferric with reducing agents. *Color* incompatibility is shown with the ferric salts, which give colored compounds with many organic bodies, particularly those containing tannin.

Ferri Oxidum Hydratum. Ferric Hydrate. (Ferric hydroxide, Hydrated Oxide of iron). To 11 cc. of ammonia water diluted with 25 cc. of cold water, add, under constant stirring, 10 cc. of solution of ferric sulphate, previously diluted with 100 cc. of cold water. As soon as the

precipitate has subsided, draw off the clear liquid with a siphon, then mix the precipitate intimately with about 100 cc. of cold water, again draw off the clear liquid after the precipitate has subsided. To purify it this may be repeated until a portion of the decanted liquid gives not more than a faint cloudiness with barium chloride test-solution. Finally the precipitate may be transferred to a wet muslin strainer, and, after it has drained, mix it with sufficient cold water to make the mixture weigh 25 grams.

This compound is used as the basis of several iron salts, citrate, tartrate, etc. It is also used as an antidote to arsenic poisoning, freely administered. It acts by producing insoluble ferrous arsenate.

Bismuth. Bismuth is found in the metallic state, and occasionally as a sulphide. Only the insoluble compounds are important medicinally.

Bismuthi Subnitras. Bismuth subnitrate. Mix a considerable quantity of bismuth subnitrate with a solution of sodium bicarbonate. Shake together in a test tube, keeping the tube closed for some time with a moistened finger. Note that a small quantity of gas (CO_2) is being formed and escapes on partially removing the finger. The evolution of the gas is slow but may be sufficient to burst a bottle. Bismuth subcarbonate would not act in this manner.

Arsenic. Although this element appears like a metal, it resembles in its compounds the non-metallic elements phosphorus and nitrogen. It is found in many minerals, generally as a sulphide or an arsenide. Its most important compound is arsenous acid As_2O_3, more properly called *arsenous anhydride.*

Arseni Iodidum. Arsenic Iodide. Take 0.5 gram of arsenic and 2.5 grams of iodine. Rub the arsenic in a mortar until reduced to a fine powder; then add the iodine and rub them together until they are thoroughly mixed. Put the mixture in a test tube, loosely stopped, and heat it very gently until liquefaction occurs. Incline the tube in different directions, in order that any portion of the iodine, which may have condensed on its surface, may be returned into the melted mass. Let the mass be-

come cold ; break the tube and break the mass into small pieces and keep it in a well-stoppered bottle.

To a solution of arsenous acid, add a solution of cupric sulphate, and then a small amount of ammonia water. Too much ammonia water will redissolve the precipitate. A green precipitate of cupric arsenite (*Scheele's green*) is produced. A mixture of this with cupric acetate is known as *Schweinfurth green*, used as coloring matter. A similar mixture but less pure, is *Paris green*.

EXERCISE IX

ORGANIC DRUGS

The majority of the organic drugs are obtained from the vegetable kingdom ; some are also derived from the animal kingdom.

The fundamental parts of all plants are *root*, *stem* and *leaf*, which with various modifications, form all the various organs of plants.

The *root* (*radix*) is the part which typically grows downward into the soil, fixes the plant, and absorbs nourishment. It usually contains no chlorophyl (green coloring matter), and has not the power of producing leaves : *e. g.* gentiana. Sometimes the *bark* (*cortex*) of the root is employed separately ; *e. g.* sassafras. If part of the root becomes greatly thickened to serve for the accumulation of reserve food material, it is called *tuber* ; *e. g.* jalapa.

The *stem* is that part of the body of the plant which, typically, grows upward bearing the leaves. While generally easily recognized, there are stems which, being subterranean, may be mistaken for roots. Thus *rhizome* is an underground stem of rootlike appearance, but capable of producing leaves ; *e. g.* Podophyllum. *Bulbs* have their stem reduced to the shape of a flat disk, rooting from the under side, and bearing above closely appressed fleshy leaves with store of nourishment ; *e. g.* Scilla, an onion-like root, the fleshy leaves of which are cut into slices

and dried. A *corm* is an underground enlargement of the stem, resembling a bulb in appearance, but differing by being solid ; *e. g.* Colchicum, obtained in commerce in transverse slices. With larger plants, the stem is transformed into *wood* (*lignum*) which is covered with *bark* (*cortex*), and in many plants encloses *pith* (*medulla*). Either of these may be used separately, as: Quassia is a wood, Cinchona a bark, Sassafras medulla, the pith.

The *leaf* (*folium*) is the expanded chlorophyl bearing organ of assimilation ; *e. g.* Digitalis.

The *flower* (*flos*, *floris*) is considered as a special modification of the leaf or seed ; it consists of the reproductive organs and their envelopes. Expanded flowers are easily recognized ; *e. g.* Arnica flowers. When the unexpanded flower heads are used, there may be greater difficulty ; as Santonica, an unexpanded flower head, resembles a seed so much that it is popularly called "Levant wormseed."

The *seed* (*semen*) is the fertilized and matured ovule of plants ; *e. g.* Linseed. The *fruit* (*fructus*) is the matured ovary, consisting of the seed and its coverings, *e. g.* Cubebs.

An *herb* (*herba*) is the whole plant with the exception of the root ; *e. g.* Lobelia.

Cellulose is the fundamental material of the cell membrane of plants. It forms the largest portion of the solid part of the plant. It is well adapted for this purpose on acccount of its tough and flexible nature and because of its insolubility in nearly all solvents. Cotton and filter paper are good examples of nearly pure cellulose.

Gossypium Purificatum. Purified Cotton. (Absorbent Cotton). The hairs of the seed of the cotton plant (raw cotton) are coated with fatty matter which prevents them from absorbing liquids freely. The cotton freed from the trace of fatty matter by boiling it in a weak alkaline solution becomes absorbent. It may be further purified by rinsing in a weak solution of chlorinated lime to whiten it, dipping it into a very dilute solution of hydrochlyric acid and then thoroughly rinsing in pure water and dried. Absorbent cotton has a wide use for pharmaceutic and surgical purposes. In the form of pyroxylin or soluble gun cotton it is used in the making of the different preparations of collodion.

Amylum. (Starch.) Starch has the same chemical composition as cellulose, $C_6H_{10}O_5$, and is closely allied to it in its properties,

Starch is stored up in plants in anticipation of future usefulness in the formation of their cell walls, growing tissues or other constituents. Starch is present in many drugs, and is an important constituent of many vegetable foods. Corn starch is official.

Mix a little starch, first with a small quantity, then with more water, and heat to the boiling point ; a starch paste or mucilage results. To a small portion add a few drops of iodine.

Repeat the experiment, but before boiling add a few drops of sulphuric acid. Note any differences and add a few drops of iodine. If boiled long enough the starch will have been converted into dextrin and some sugar.

Heat very carefully in a porcelain evaporating dish 5 grams of powdered starch, with constant stirring. It gradually turns brown. After heating for about five or ten minutes, add four times its bulk of water and boil. A solution of *dextrin* will be obtained which may be filtered off from the unaltered starch. To a portion of the solution, add twice its bulk of alcohol, dextrin will be precipitated, as it is insoluble in alcohol.

Saccharum. Sugar. (Saccharose, Cane Sugar, Beet Sugar). Sugar is found in the juices of many plants, (sugar cane, sugar beet and in some trees—maple). In commerce it is found in various forms ; it is known as *rock candy*, when in large crystals ; *granulated sugar*, when in crystalline granules ; *loaf* or *lump sugar*, when the crystals are dried in moulds ; *lozenge sugar*, the best variety of powdered sugar ; *molasses*, a syrupy liquid obtained as a by-product of sugar manufacture, containing principally uncrystallizable sugar. Sugar is of great importance in pharmacy and is a constituent of a great many preparations, as syrups, elixirs, troches, etc.

In an evaporating dish, heat *very cautiously* a small quantity of white sugar until it melts. Let the pasty liquid cool rapidly ; the product is *barley sugar*. Heat again to a still higher temperature, the sugar turns brown, froths, gives off pungent vapors, and there remains a dark brown mass which is known as *caramel*, or burnt sugar. It is used largely for coloring aqueous or hydro-alcoholic liquids. If the sugar is heated too rapidly and too in-

tensely, it will take fire and burn, leaving a black carbonaceous residue.

Make 100 cc. of a 1% solution of sugar. Test a portion of it with Fehling's solution and note whether any reduction occurs. Take 50 cc. of the solution and add five drops of hydrochloric acid and heat on the water bath for a half an hour. Test a portion of this solution with Fehling's. Reduction should occur, indicating the presence of *dextrose*. It may also be prepared by boiling starch with very weak sulphuric acid. The latter process is used in preparing it commercially.

The organic drugs used in medicine are exceedingly numerous. Some of the more important ones and the preparations into which they enter will be referred to later in the pharmaceutic work.

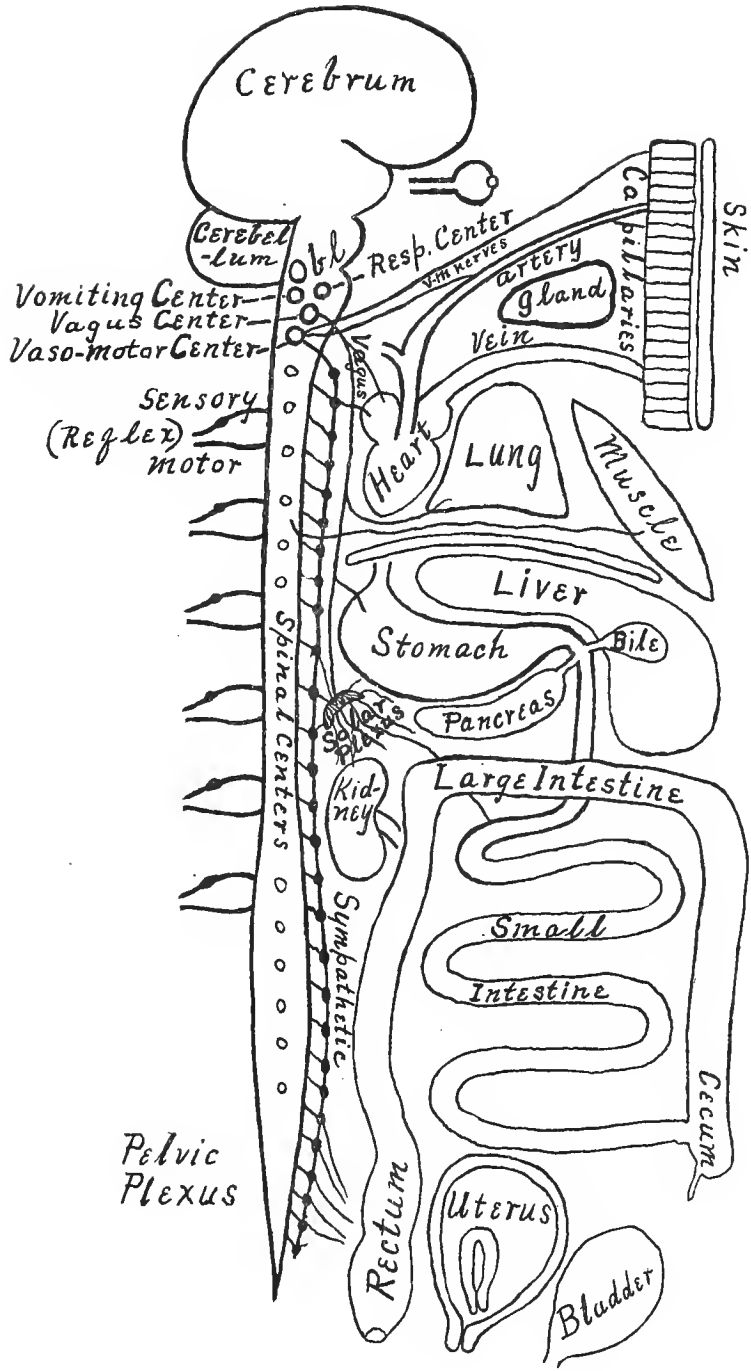
EXERCISE X

MATERIA MEDICA

In this section twelve of the more important drugs have been selected for a study of their physiologic actions. This information is to be obtained from standard text books on Materia Medica in the laboratory. The student should consult at least three and glean from them the facts called for by the headings on the blank pages. As each drug is studied there will be furnished specimens of the crude drugs and the various preparations into which they enter. These should be observed carefully and notes made of any peculiarity characteristic of them. When the notes of a given drug have been completed, use them as a basis and plat upon the accompanying chart the characteristic actions of the drug.

The charts are intended for a graphic representation of the action of the drugs. The student is to mark directly upon the tissues or organs by an appropriate sign the specific action of the drug. In general the + sign is to be used to indicate the action of any agent which stimulates or augments the activity of a given organ or tissue ; the — sign to indicate an agent which depresses

or diminishes the activity of the tissue. Explanatory notes should be freely used on the margin of the figure, when the symbol does not express the action of the drug with sufficient accuracy. For example a + placed on the intestine may mean increased peristalsis or increased secretions. A marginal note in this and similar instances will make the meaning clear. The + may also be used to indicate dilatation of the vessels and the — sign to indicate their contraction.


Cerebrum
Cerebel-lum
Obl.
Resp. Center
V-M nerves
Vomiting Center
Vagus Center
Vaso-motor Center
Sensory
(Reflex)
motor
Vagus
Capillaries
Skin
artery
gland
Vein
Heart
Lung
Muscle
Liver
Stomach
Bile
Pancreas
Solar Plexus
Kid-ney
Large Intestine
Small
Intestine
Cecum
Spinal Centers
Sympathetic
Pelvic Plexus
Rectum
Uterus
Bladder

Acetanilidum. Write notes. Test solubility in water and alcohol, first in the cold, then by heating. Test also in cool ether. Acetanilid is prepared from a mixture of anilin and glacial acetic acid.

Preparation of Anilin from Acetanilid. Powder a piece of sodium hydroxide the size of a grain of corn. Mix this with 1 gm. of acetanilid and put into a test-tube. Apply heat. Note the oil globules that arise as the mixture melts. Sudden solidification will occur. Then invert the test-tube so that the anilin oil may run out, catching it in another test-tube containing 3 cc. of water. Continue heating the solidified substance as long as the oil continues to drip from the tube. In the second tube there will form a good sized globule of anilin oil. Note its odor. As a result of the above treatment anilin and sodium acetate is formed.

Acetanilid is incompatible with : amyl nitrite, bromine and bromides of alkalies ; carbolic acid ; chloral hydrate ; iodides of alkalies ; nitrites ; piperazine ; potassium hydroxide ; pyrocatechin ; resorcin ; sodium hydroxide ; spirits nitrous ether ; thymol.

Write a prescription containing acetanilid.

Technical name of drug

Synonyms

Solubility

Parts used

Official preparations and doses

Incompatibles

Synergists

Local action

Digestive system

Vascular system

Nervous system

Respiration

Temperature

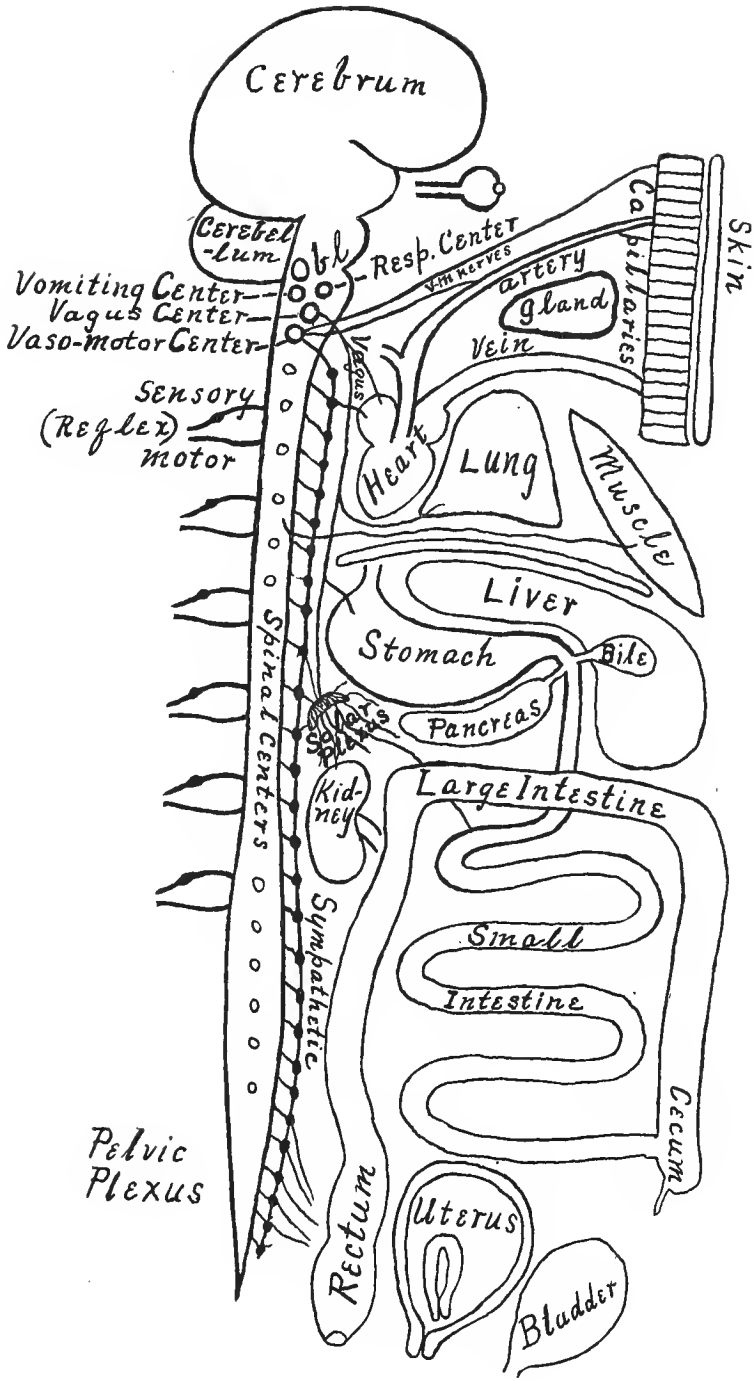
Absorption

Elimination

Abbreviations of text books used (at least three)

Prescription ℞

General


Cerebrum
Cerebel-lum
Obl.
Resp. Center
Vomiting Center
Vagus Center
Vaso-motor Center
Vm nerves
artery
gland
vein
Capillaries
Skin
Sensory
(Reflex)
motor
Vagus
Heart
Lung
Muscle
Liver
Stomach
Bile
Pancreas
Spinal Centers
Kidney
Large Intestine
Sympathetic
Small Intestine
Cecum
Pelvic Plexus
Rectum
Uterus
Bladder

Aconitum. Examine crude drug and official preparations. The preparations from the root are more active than those from the leaves. Write up notes. The strength of the different tinctures varies considerably: German 10%; English 16%; French 20%; U. S. P. 35% and Flemings 79%. Be careful in prescribing them. Aconite is incompatible with acids, alkalies and metallic salts. Atropine; digitalis; morphine; scoparin; strychnine.

Write a prescription containing aconite.

Technical name of drug

Synonyms

Solubility

Parts used

Official preparations and doses

Incompatibles

Synergists

Local action

Digestive system

Vascular system

Nervous system

Respiration

Temperature

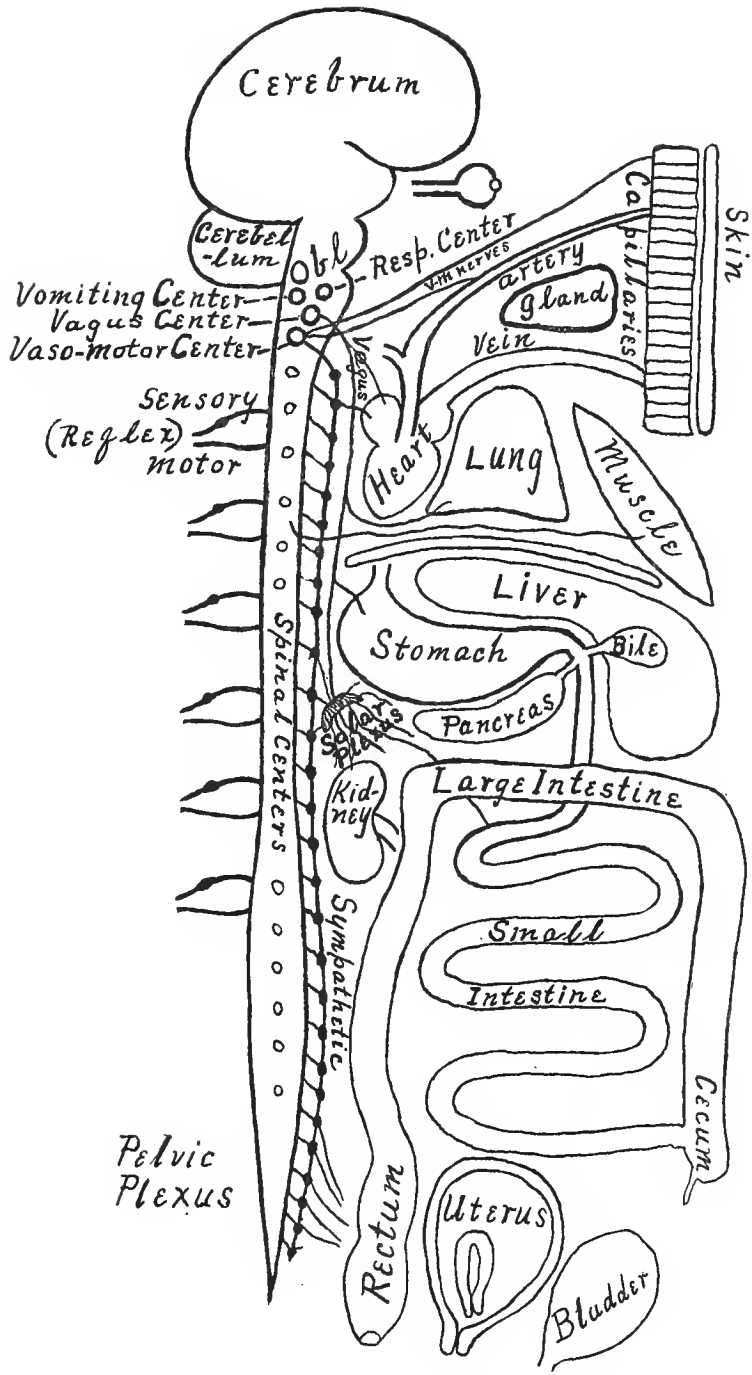
Absorption

Elimination

Abbreviations of text books used (at least three)

Prescription ℞

General


Cerebrum
Cerebel-lum
Obl
Resp. Center
V-M NERVES
Vomiting Center
Vagus Center
Vaso-motor Center
Sensory
(Reflex)
motor
Vagus
artery
gland
Vein
Capillaries
Skin
Heart
Lung
Muscle
Liver
Stomach
Bile
Pancreas
Solar Plexus
Kid-ney
Large Intestine
Small Intestine
Cecum
Spinal Centers
Sympathetic
Pelvic Plexus
Rectum
Uterus
Bladder

Belladonna. Examine the crude drug and its preparation. Test physical compatibility of the fluid extract with water; alcohol. Write notes of its physiological action. Test compatibility with Liquor Potasse; with Acid Nitric dil.; with solution Plumbi Acetatis; with Acid Tannici. Preparations are made from both root and leaves.

Belladonna is incompatible with alkali hydrates or acids; vegetable decoctions or infusions; aconitine; bromal hydrate; chloral hydrate; hydrocyanic acid; jaborandi; morphine; muscarine; physostigmine; phytolacca; quinine.

Write a prescription containing belladonna.

Technical name of drug

Synonyms

Solubility

Parts used

Official preparations and doses

Incompatibles

Synergists

Local action

Digestive system

Vascular system

Nervous system

Respiration

Temperature

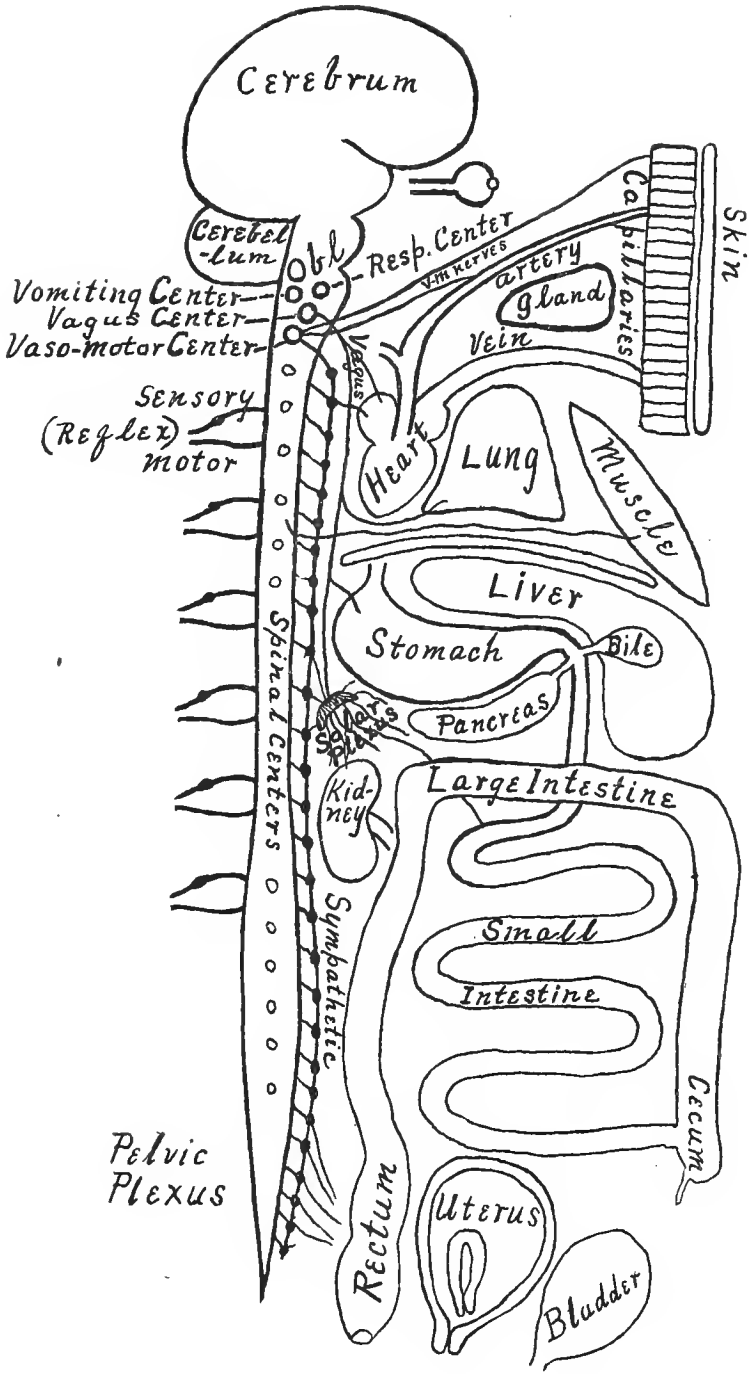
Absorption

Elimination

Abbreviations of text books used (at least three)

Prescription ℞

General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Rectum
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Bladder
Spinal Centers
Sympathetic
Pelvic Plexus
Vm nerves
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Vein
Capillaries
Skin

EXERCISE XI

Cannabis Indica. Examine the crude drug and preparations. Test the incompatibility of the tincture with liquor potassae and distilled water. Write up notes. Prescription containing Cannabis Indica.

Technical name of drug

Synonyms

Solubility

Parts used

Official preparations and doses

Incompatibles

Synergists

Local action

Digestive system

Vascular system

Nervous system

Respiration

Temperature

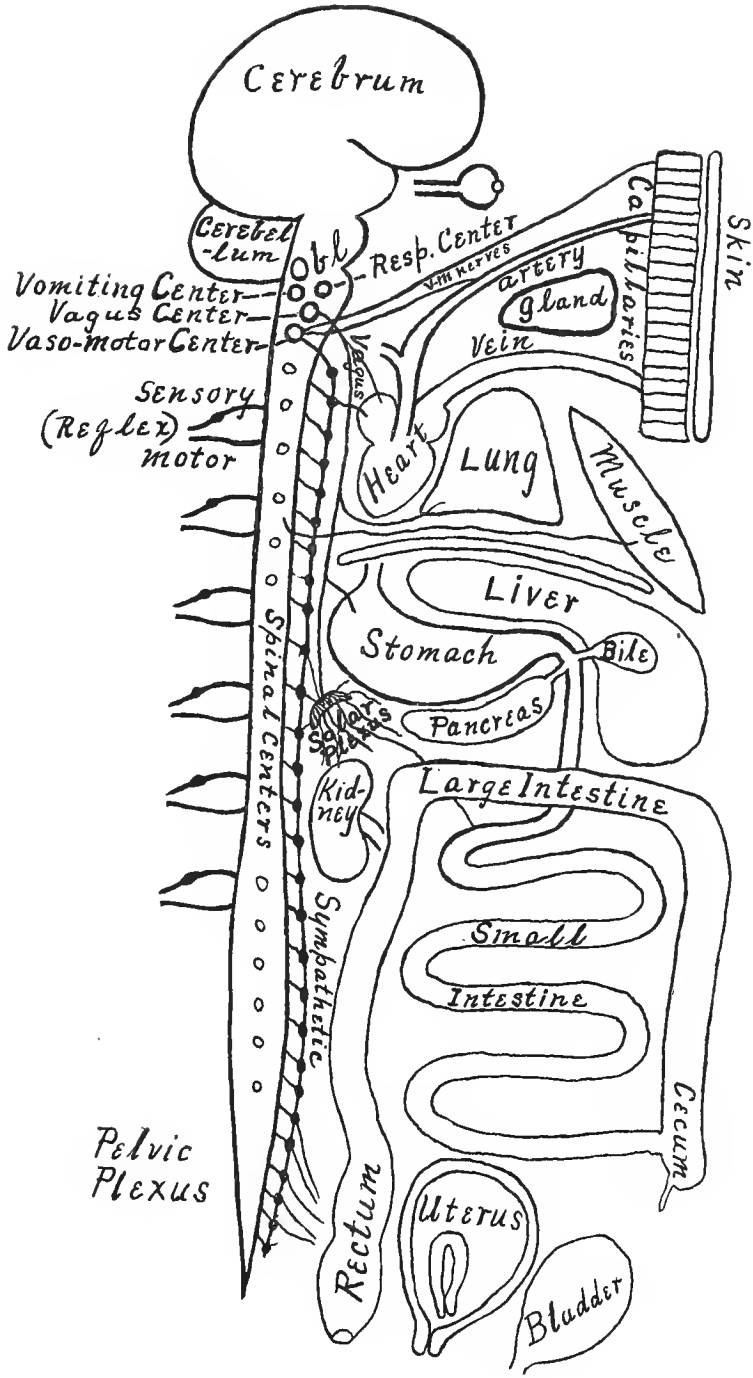
Absorption

Elimination

Abbreviations of text books used (at least three)

Prescription ℞

General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Rectum
Uterus
Bladder

Chloral Hydrate. Write notes. Test solubility in water, alcohol and ether. Test chemical reaction. It should be neutral if fresh, but later may become acid. Preparation of chloroform. To a test-tube coutaining some chloral hydrate add a little caustic potash solution. Note if the temperature is affected. The liquid separates into two portions which may be distinguished by their different refractive powers. The lower portion is of higher specific gravity and is chloroform. Add a crystal of iodine. This is soluble in chloroform and colors the lower portion but not the upper. A cheaper and more common method of preparing chloroform is by heating together chlorinated lime, water and alcohol.

Chloral Hydrate is incompatible with: acetanilid; alcohol; alkalies; ammonium salts; borax; camphor; carbolic acid; lead acetate; mercuric oxide and nitrate; phenacetin; potassium cyanide; potassium permanganate; potassium iodide; quinine sulphate; salol; sodium phosphate; ammonium chloride; atropine; brucine; caffeine; cocaine; codeine; digitalis; physostigmine; strychnine.

Write a prescription containing chloral hydrate.

Technical name of drug

Synonyms

Solubility

Parts used

Official preparations and doses

Incompatibles

Synergists

Local action

Digestive system

Vascular system

Nervous system

Respiration

Temperature

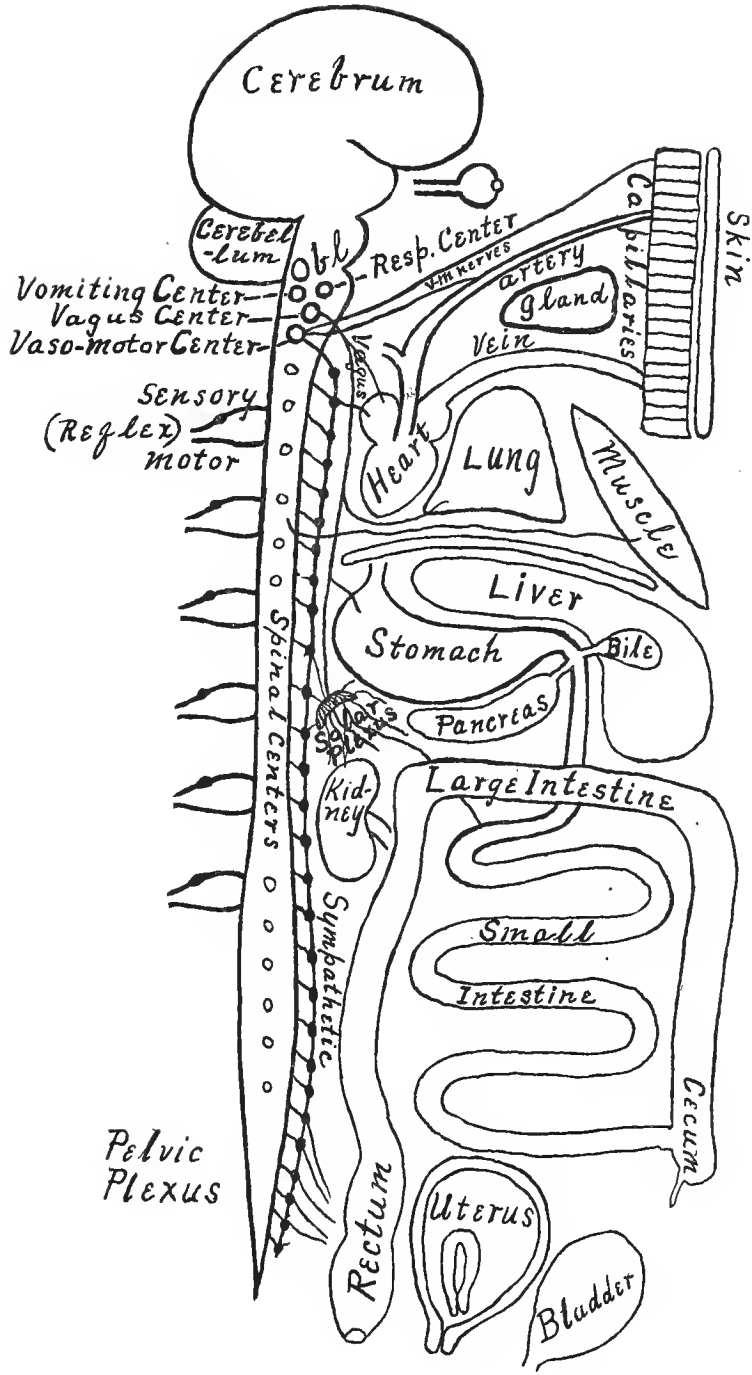
Absorption

Elimination

Abbreviations of text books used (at least three)

Prescription ℞

General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Cecum
Spinal Centers
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Rectum
Uterus
Bladder

Coca. Study the crude drug and the fluid extract of coca on the desk. Test physical compatibility with a solution of tannic acid, liquor potassae; a solution of sodium bicarbonate. Why should not the fluid extract of coca be prescribed along with chloral or opium? Write up notes.

Cocaine hydrochlorate is incompatible with: calomel; chloroform water; mercuric oxide; silver nitrate. Physiologically with alcohol; amyl nitrite; caffeine; chloral hydrate; digitalis; morphine.

Write a prescription containing coca or cocaine hydrochlorate.

Technical name of drug

Synonyms

Solubility

Parts used

Official preparation and doses

Incompatibles

Synergists

Local action

Digestive system

Vascular system

Nervous system

Respiration

Temperature

Absorption

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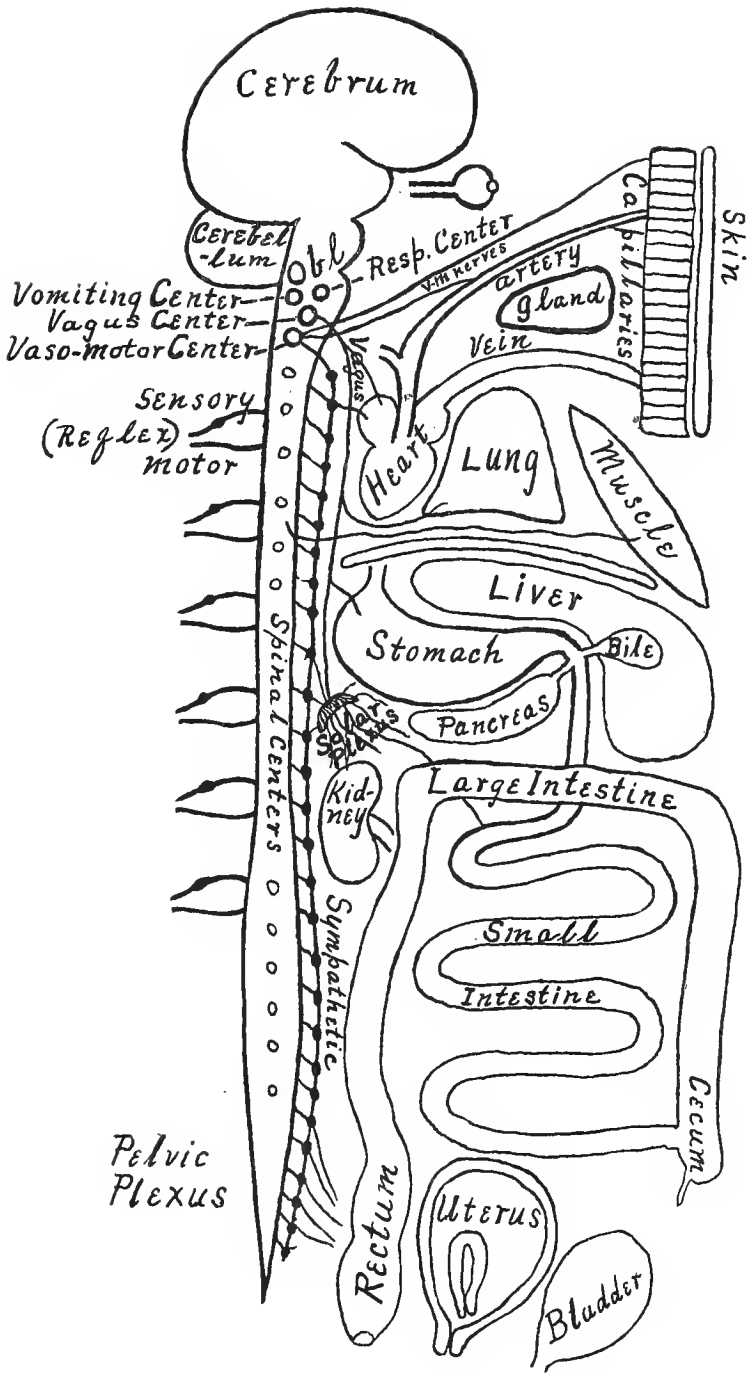
Abbreviations of text books used (at least three)

Prescription ℞

General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Cecum
Pelvic Plexus
Rectum
Uterus
Bladder

EXERCISE XII

Digitalis. Study the crude drug and preparations. Test compatibility of the tincture with the tincture of cinchona, solutions of lead acetate, iron sulphate, and the tincture of the chloride of iron. Write up notes.

Digitalis is incompatible with acids; alkalies; alkaloidal precipitants; cinchona infusion; ferrous sulphate; lead acetate; tannic acid and other vegetable astringents. It antagonizes aconite; chloral hydrate; cocaine; glonoin; muscarine; scoparin; saponin; strychnine.

Write a prescription containing digitalis.

Technical name of drug

Synonyms

Solubility

Parts used

Official preparation and doses

Incompatibles

Synergists

Local action

Digestive system

Vascular system

Nervous system

Respiration

Temperature

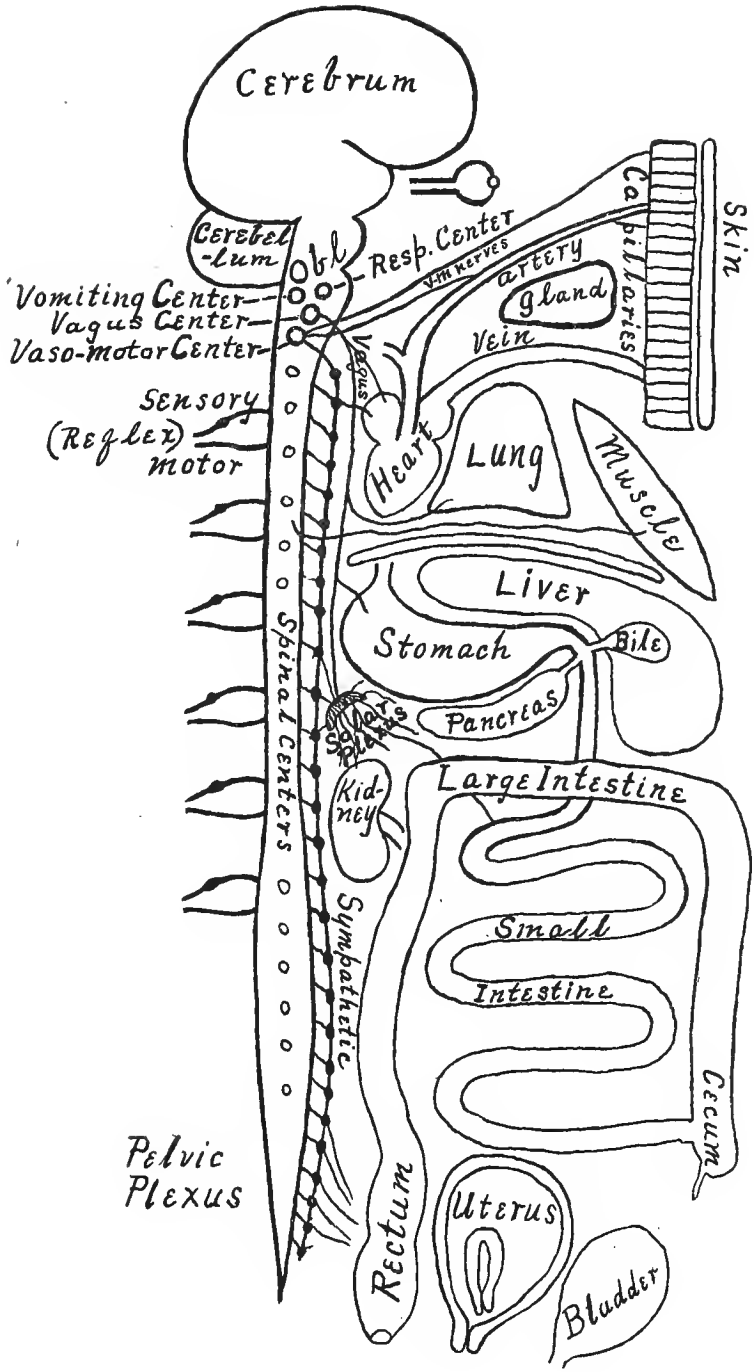
Absorption

Elimination

Abbreviations of text books used (at least three)

Prescription ℞

General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Spinal Centers
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Rectum
Uterus
Bladder

Ergot. Crude drug and preparations. Test physical compatibility of the fluid extract with water. Also with liquor potassae and lead acetate solutions. Write notes. Ergot is incompatible with alkaloidal precipitants and tannic acid. Write a prescription containing ergot.

Technical name of drug

Synonyms

Solubility

Parts used

Official preparation and doses

Incompatibles

Synergists

Local action

Digestive system

Vascular system

Nervous system

Respiration

Temperature

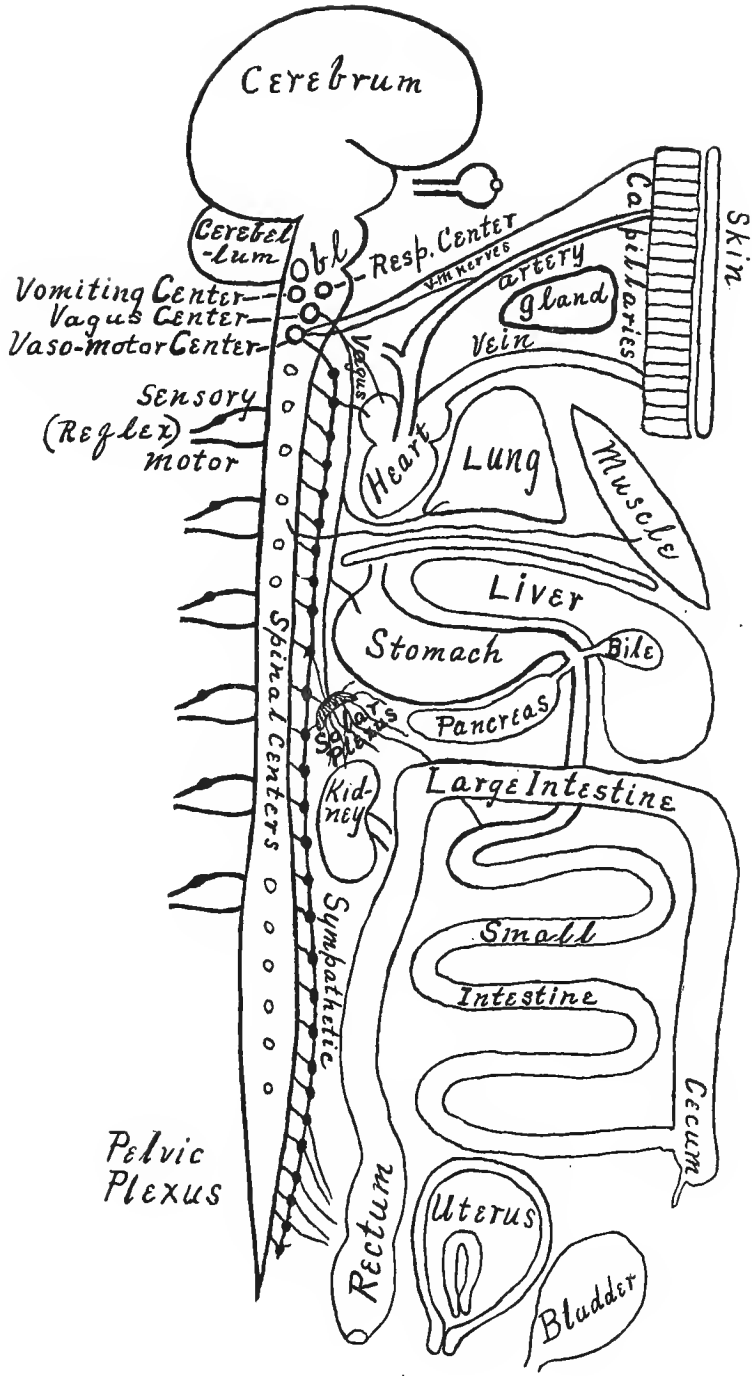
Absorption

Elimination

Abbreviations of text books used (at least three)

Prescription ℞

General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Solar Plexus
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Large Intestine
Small Intestine
Cecum
Rectum
Uterus
Bladder

Nux Vomica. Examine the crude drug and preparations. Test physical compatibility of the tincture with water. Also test its compatibility with a solution of potassium bromide, sodium chloride, and tannic acid. In what way are choral, chloroform and tobacco physiological antagonists? Write up notes. Incompatibles of nux or strychnine are all alkaloidal precipitants. Antagonists are: aconite; alcohol; amyl nitrite; atropine; chloral hydrate; chloroform; curarine; digitalis; hydrocyanic acid; morphine; nicotine; paraldehyde; physostigmine; potassium bromide; urethane.

Write a prescription containing nux.

Technical name of drug

Synonyms

Solubility

Parts used

Official preparation and doses

Incompatibles

Synergists

Local action

Digestive system

Vascular system

Nervous system

Respiration

Temperature

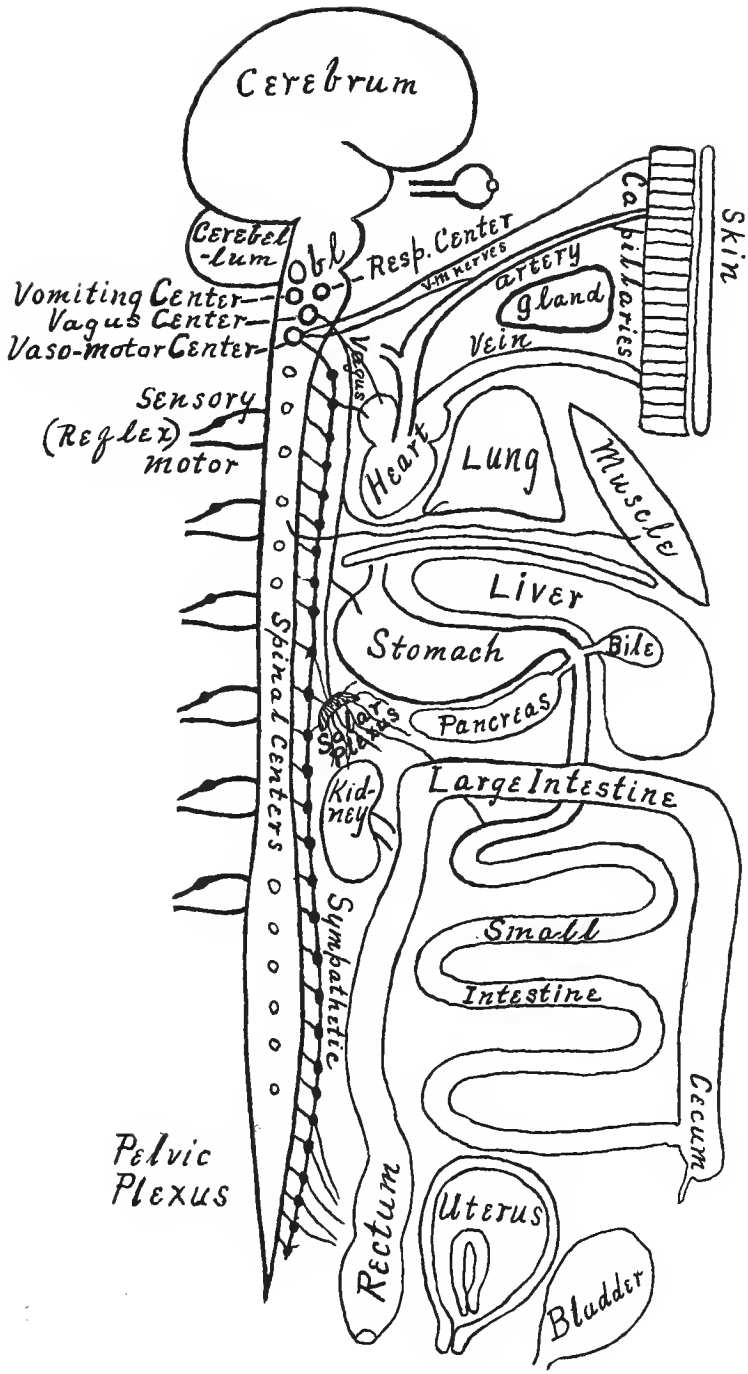
Absorption

Elimination

Abbreviations of text books used (at least three)

Prescription ℞

General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Spinal Ganglia
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Large Intestine
Spinal Centers
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Small Intestine
Cecum
Pelvic Plexus
Rectum
Uterus
Bladder

EXERCISE XIII

Opium. Examine crude drug and preparations. Try physical compatibility of the tincture with water. Try compatibility using the tincture with Tinct. Ferri chloridi diluted ; with solutions of silver nitrate, and lead acetate ; with a solution of tannic acid ; with liquor potassae. Write notes.

Write a compound prescription containing opium. Opium is incompatible with : alkalies ; alkaloidal precipitants ; carbonates ; catechu ; cinchona ; copper salts ; kino ; lead acetate and subacetate ; lime water ; mercuric chloride ; silver nitrate ; zinc sulphate. Antagonists are atropine ; caffeine ; chloroform ; cocaine; daturine ; gelsemium ; hyoscyamine ; nicotine ; paraldehyde ; physostigmine ; picrotoxin ; veratrum viride.

Technical name of drug

Synonyms

Solubility

Parts used

Official preparations and doses

Incompatibles

Synergists

Local action

Digestive system

Vascular system

Nervous system

Respiration

Temperature

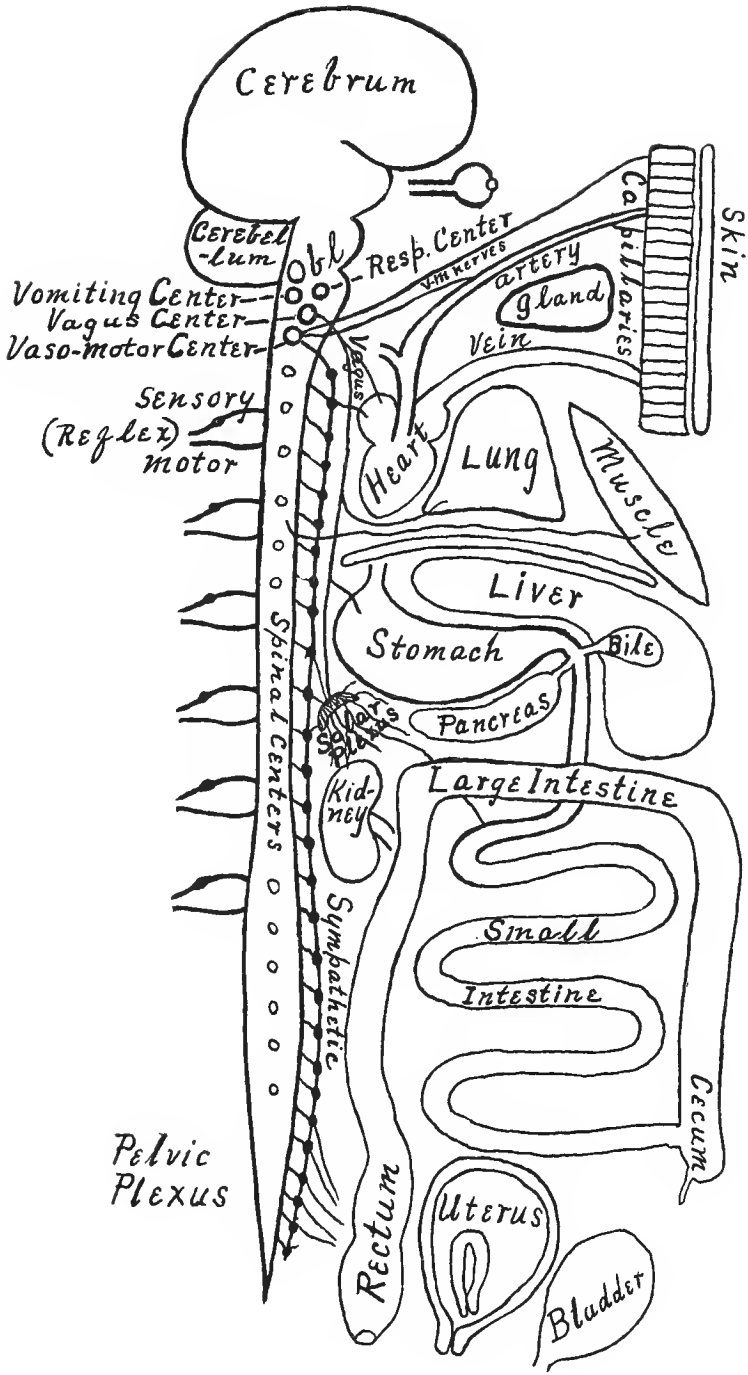
Absorption

Elimination

Abbreviations of text books used (at least three)

Prescription ℞

General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Rectum
Uterus
Bladder

Physostigma. Crude drug and preparations. Try physical compatibility of the tincture with water. Write up notes. Write a prescription containing physostigma. Physostigma is antagonized by : atropine ; caffeine ; chloral hydrate ; morphine ; strychnine.

Technical name of drug

Synonyms

Solubility

Parts used

Official preparation and doses

Incompatibles

Synergists

Local action

Digestive system

Vascular system

Nervous system

Respiration

Temperature

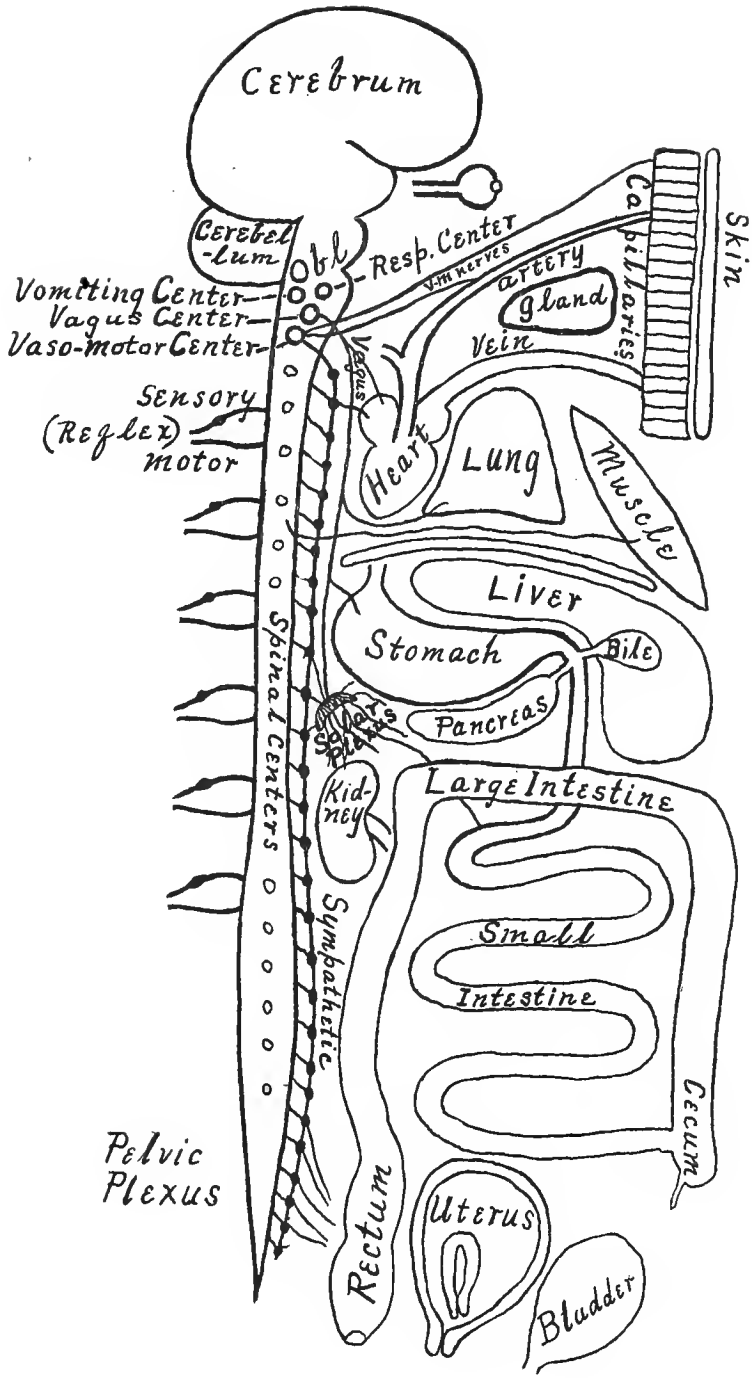
Absorption

Elimination

Abbreviations of text books used (at least three)

Prescription ℞

General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Solar Plexus
Kid-ney
Large Intestine
Small Intestine
Cecum
Rectum
Uterus
Bladder

Pilocarpus. Examine the crude drug and its preparations. Write notes of the physiologic action of the drug. Write a prescription containing pilocarpus or its principal alkaloid. Pilocarpine is incompatible with alkaloidal precipitants; calomel; potassium permanganate. Its principal antagonistic is atropine.

Technical name of drug

Synonyms

Solubility

Parts used

Official preparation and doses

Incompatibles

Synergists

Local action

Digestive system

Vascular system

Nervous system

Respiration

Temperature

Absorption

Elimination

Abbreviations of text books used (at least three)

Prescription ℞

General

EXERCISE XIV

Accuracy and cleanliness are very essential in the making of pharmaceutic preparations. It is therefore necessary to use labels plentifully to mark the different stages in the preparation of the product, so that every step may be followed with absolute certainty. Guess work is worse than useless because it invites error. On the finished product the student should write : (a) the name of the preparation ; (b) his own name ; (c) the date. If this is not done the preparation will be valueless and the material wasted. The student will be required to make the preparation over again and charged extra for the additional material.

Students are advised to consult freely the larger text books on pharmacy and gain as comprehensive an insight as possible of the different groups of preparations and the methods of making them.

AQUAE (WATERS)

Aqua—An aqueous solution of a volatile substance. There are eighteen official waters (U. S. P. 1890), divided into three classes, according to their method of preparation. (1) Direct solution. (2) Filtration through an absorbent powder. (3) Distillation.

1. Direct solution—simple agitation—*e. g.*, Aqua Chloroformi, etc. By dissolving gases in cold water, Aqua Ammoniae, etc.

2. Filtration through an absorbent powder *e. g.*, Aqua Menthae Piperitae, etc.

3. Distillation. Aqua Rosae. Aqua Destillata, etc.

Make the following preparations :

AQUA CHLOROFORMI

℞			
	Chloroform		0.6 cc.
	Distilled Water	q. s.	100. cc.

Add the Chloroform to the Distilled Water and agitate thoroughly. This gives a saturated solution.

AQUA CAMPHORAE

℞		
	Camphor	0.8 gm.
	Alcohol	0.5 cc.

Precipitated Calcium Phosphate		0.5 gm.
Distilled Water	q. s.	100. cc.

Triturate the Camphor with the Alcohol and with the Precipitated Calcium Phosphate, then with the Water gradually added, and filter.

AQUA CINNAMONI

℞ Oil of Cinnamon		0.2 cc.
Precipitated Calcium Phosphate		0.4 gm.
Distilled Water	q. s.	100. cc.

Triturate the Oil of Cinnamon with the Calcium Phosphate, add the Water gradually under constant trituration and filter.

LIQUORES (SOLUTIONS)

A liquor is an aqueous solution of a chemical substance. There are twenty-four official liquors (U. S. P. 1890). They are divided into two classes according to the method of preparations. (1) Simple solution, *e. g.*, Liquor Acidi Arsenosi. (2) Solution prepared by chemical decomposition, *e. g.*, Liquor Ammonii Acetatis.

LIQUOR ACIDI ARSENOSI

℞ Arsenous Acid (in fine powder)		0.5 gm.
Diluted Hydrochloric Acid		2.5 cc.
Distilled Water	q. s.	50. cc.

Mix the Diluted Hydrochloric Acid with 12.5 cc. of Distilled Water. Add the Arsenous Acid and boil until the latter is dissolved. Filter the solution and pass enough additional Distilled Water through the filter to make the final product measure 50 cc.

LIQUOR POTASSII ARSENITIS (FOWLER'S SOLUTION)

℞ Arsenous Acid (in fine powder)		0.5 gm.
Potassium Bicarbonate		1. gm.
Compound Tincture of Lavender		1.5 cc.
Distilled Water	q. s.	50. cc.

Boil the Arsenous Acid and Potassium Bicarbonate with 50 cc. of Distilled Water until thoroughly dissolved. Then add

enough Distilled Water to make the solution, when cold measure 48.5 cc., and lastly add the Compound Tincture of Lavender. Filter through paper.

EXERCISE XV

SYRUPI (SYRUPS)

Syrups are concentrated solutions of sugar in water, usually medicated or flavored. There are thirty-two official syrups (U. S. P. 1890), classified according to their preparation, as follows: (1) Solution with heat, *e. g.*, Syrupus Calcis. (2) Agitation of sugar with medicating liquid or simple admixture without heat, *e. g.*, Syrupus Pruni Virginianae. (3) Simple addition of medicating liquid to syrup, *e. g.*, Syrupus Zingiberis. (4) Maceration or digestion, *e. g.*, Syrupus Picis Liquidae.

SYRUPUS ZINGBERIS

℞		
	Fluid Extract of Ginger	1.5 cc.
	Precipitated Calcium Phosphate	0.75 gm.
	Sugar	42.5 gm.
	Water q. s.	50. cc.

Triturate the Fluid Extract of Ginger with the Calcium Phosphate and expose the mixture in a warm place until the alcohol has evaporated. Then triturate the residue with 22.5 cc. of Water and filter. In the filtrate dissolve the Sugar by agitation, without heat. Strain and pass enough water through the filter to make the product measure 50 cc. Mix thoroughly.

SYRUPUS (SYRUP)

℞		
	Sugar in coarse powder	42.5 gm.
	Distilled Water q. s.	50. cc.

Dissolve the Sugar with the aid of heat in 22.5 cc. of Water, raise the temperature to the boiling point, strain the liquid, and pass enough water through the strainer to make the product when cold, measure 50 cc. Mix thoroughly.

SYRUPUS ACIDI CITRICI

℞		
	Citric Acid	0.5 gm.
	Water	0.5 cc.
	Spirit of Lemon	0.5 cc.
	Syrup q. s.	50. cc.

Dissolve the Citric Acid in the Water, and mix the solution with 25 cc. of Syrup. Then add the Spirit of Lemon, and, lastly, enough Syrup to make the product measure 50 cc. Mix thoroughly.

MELLITA (HONEYS)

Honeys are thick liquid preparations closely allied to syrups, differing merely in the use of honey as a base, instead of syrup. There is no especial advantage over syrups in their use. Three honeys are official in U. S. P. 1890.

MEL ROSAE

℞		
	Fluid Extract of Rose	6. cc.
	Clarified Honey q. s.	50. gm.

Into a tared (weighed) vessel introduce the Fluid Extract of Rose, then add enough Honey to make the contents weigh 50 grams, and mix them thoroughly.

EXERCISE XVI

MUCILAGINES (MUCILAGES)

Mucilages are thick, viscid, adhesive liquids, produced by dissolving gum in water or by extracting, with water, the mucilaginous principles from vegetable substances. There are four official mucilages (U. S. P. 1890). As the mucilages are prone to decomposition, they should not be made in larger quantities than to last a short time.

MUCILAGO ACACIAE

℞	Acacia in small fragments	17 gm.
	Water q. s.	50 gm.

Wash the Acacia with cold Water, and let it drain. Then add to it enough Water to make the mixture weigh 50 grams, agitate or stir occasionally until the Acacia is dissolved, and strain. Keep the product in a well stoppered bottle in a cool place. This amount of mucilage may be better preserved by the addition of 1 gram of Chloral Hydrate.

EMULSA (EMULSIONS)

Emulsions are aqueous liquids in which oleaginous substances are suspended by the intervention of gum, yolk of egg, or other viscid matter. There are four official emulsions. (U. S. P. 1890).

EMULSUM CHLOROFORMI

℞	Chloroform	2. cc.
	Expressed Oil of Almond	3. cc.
	Tragacanth (in very fine powder)	0.75 gm.
	Water q. s.	50. cc.

Introduce the Tragacanth into a perfectly dry 2 oz. bottle. Add the Chloroform and shake the bottle thoroughly so that every part of the surface may become wetted. Then add about 12.5 cc. of Water and incorporate it by vigorous shaking. Next add the Expressed Oil of Almond, in several portions, shaking after each addition and when the Oil has been thoroughly emulsified, add enough Water in divided portions, shaking after each addition, to measure 50 cc.

MISTURAE (MIXTURES)

Mixtures are aqueous liquid preparations intended for internal use, which contain suspended insoluble substances. They are not permanent as a rule and should therefore be made up as needed. There are four official mixtures (U. S. P. 1890).

MISTURA CRETAE

℞		
	Compound Chalk Powder	10 gm.
	Cinnamon Water	20 cc.
	Water q. s.	50 cc.

Rub the Compound Chalk Powder, in a mortar, with the Cinnamon Water and about 10 cc. of Water gradually added, to a uniform mixture; transfer this to a graduated vessel, and rinse the mortar with enough Water to make the product measure 50 cc. Mix the whole thoroughly.

GLYCERITA (GLYCERITES)

Glycerites are mixtures of medical substances with glycerin. There are six official glycerites (U. S. P. 1890).

GLYCERITUM ACIDI TANNICI

℞		
	Tannic Acid	10 gm
	Glycerin	40 gm

Weigh the Tannic Acid and Glycerin, successively into a tared porcelain capsule, avoiding contact with metallic utensils, apply the heat of a water bath, until the acid is completely dissolved. Then transfer the solution to a 2 oz. bottle.

GLYCERITUM AMYLI

℞		
	Starch powdered	4 gm.
	Water	4 cc.
	Glycerin	32 cc.

Put the Starch in an evaporating dish, add the Water and Glycerin, and stir until a homogenous mixture is produced. Then apply a heat gradually raised to 140° C and not exceeding 144° C, stirring constantly until a translucent jelly is formed.

EXERCISE XVII

SPIRITUS (SPIRITS)

From a pharmaceutic point of view, spirits are simply *alcoholic* solutions of volatile substances. Like the medicated waters, the active incredient may be solid, liquid or gaseous. They are prepared in five ways: 1. By simple solution. 2. Solution by maceration. 3. By gaseous solution. 4. By chemical reaction. 5. By distillation. There are 25 official spirits (U. S. P. 1890).

SPIRITUS CAMPHORAE

℞		
	Camphor	5 gm.
	Alcohol q. s.	50 cc.

Dissolve the Camphor in 40 cc. of Alcohol, filter through paper and pass enough Alcohol through the filter to make the product measure 50 cc.

SPIRITUS AMMONIAE AROMATICUS

℞		
	Ammonium Carbonate	3.4 gm.
	Ammonia Water	9. cc.
	Oil of Lemon	1. cc.
	Oil of Lavender Flowers	0.1 cc.
	Oil of Nutmeg	0.1 cc.
	Alcohol	70. cc.
	Distilled Water q. s.	100. cc.

To the Ammonia Water, contained in a flask, add 14 cc. of Distilled Water, and afterwards the Ammonium Carbonate reduced to a moderately fine powder. Close the flask and agitate the contents until the carbonate is dissolved. Introduce the Alcohol into a graduated bottle of suitable capacity, add the oils, then gradually add the solution of Ammonium Carbonate and afterwards enough distilled water to make the product measure 100 cc. Set the liquid aside for 24 hours in a cool place, occasionally agitating, then filter it through paper in a well covered funnel. (If the white crystalline precipitate which often falls when the water is added has not disappeared after the liquid has

stood 24 hours, shake thoroughly and allow it to stand a day longer before filtering.)

Keep the product in glass-stoppered bottles in a cool place.

ELIXIRIA (ELIXIRS)

Elixirs are aromatic, sweetened spirituous preparations, containing small quantities of active medicinal substances. Two are official (U. S. P. 1890).

ELIXIR AURANTII. (UNOFFICIAL)

℞			
	Oil of Orange Peel		0.25 cc.
	Cotton (absorbent)		0.5 gm.
	Sugar in coarse powder		25. gm.
	Alcohol and Water	q. s.	75. cc.

Mix the Alcohol and Water in the proportion of one of the former to three of the latter, sprinkle the Oil on the Cotton and pick it over thoroughly to distribute the Oil. Put into a funnel and pass the diluted Alcohol through it until 75 cc. are obtained. In this dissolve the sugar without heat.

COLLODIA (COLLODIONS)

Collodions are liquid preparations intended for external use, having for the base a solution of Pyroxylin, or gun cotton, in a mixture of ether and alcohol. They leave a film on evaporation, which serves as a protection or an application of a medicinal ingredient to the skin. There are four official collodions (U. S. P. 1890).

PYROXYLIN. SOLUBLE COTTON

Mix 30 cc. of strong Sulphuric Acid with 40 cc. of strong Nitric Acid in a beaker. Cool the mixture and then add to it 2 grams of shredded Absorbent Cotton, and allow it to macerate for about fifteen minutes. Wash the Cotton entirely free from the acids, testing occasionally with litmus. Pick the Cotton into small bits upon filter paper. When dry test its solubility in a mixture composed of Ether, 3 parts, and Alcohol, 1 part. If not soluble it cannot be used.

COLLODIUM. COLLODION

℞		
	Pyroxylin	2 gm.
	Ether	50 cc.
	Alcohol	18 cc.

Put the Pyroxylin in a suitable bottle, add the Ether and, after standing a few minutes, add the Alcohol and shake until the Pyroxylin is dissolved. Keep the Collodion in cork stoppered bottles, in a cool place and away from lights and fire.

COLLODIUM FLEXILE. FLEXIBLE COLLODION

℞		
	Collodion	18.4 gm.
	Canada Turpentine	1. gm.
	Castor Oil	0.6 gm.

Weigh the ingredients, successively, into a bottle of known weight, and mix them thoroughly. Keep in cork-stoppered bottles, in a cool place, away from lights or fire.

COLLODIUM STYPTICUM. STYPTIC COLLODION

℞			
	Tannic Acid		4 gm.
	Alcohol		1 cc.
	Ether		5 cc.
	Collodion	q. s.	20 cc.

Put the Tannic Acid, Alcohol and Ether into a graduated bottle, shake until the Tannic Acid is thoroughly incorporated and partially dissolved, then add enough Collodion to make up the volume to 20 cc. Keep in cork-stoppered bottles in a cool place, away from lights or fire.

EXERCISE XVIII

LINIMENTA. (LINIMENTS)

Liniments are solutions of various substances or mixtures in oily or alcoholic liquids containing fatty oils, intended for exter-

nal applications. There are nine official liniments (U. S. P. 1890) of which three are made with a fixed oil as a base, five with alcohol as the principal liquid, and one contains oil of turpentine.

LINIMENTUM SAPONIS

℞		
	Soap (in fine powder)	7. gm.
	Camphor	4.5 gm.
	Oil of Rosemary	1. cc.
	Alcohol	75. cc.
	Water q. s.	100. cc.

Introduce the Camphor and the Alcohol into a 4 oz. bottle and shake until the Camphor is dissolved. Then add the Soap and Oil of Rosemary and shake the bottle well for a few minutes. Lastly add enough Water to make 100 cc. and again shake until the liquid becomes clear. Set it aside in a cool place for twenty-four hours, then filter.

LINIMENTUM CHLOROFORMI

℞		
	Chloroform	15 cc.
	Soap Liniment	35 cc.

Mix them by agitation.

LINIMENTUM CAMPHORAE

℞		
	Camphor, in coarse powder	5 gm.
	Cotton Seed Oil	20 gm.

Introduce the Camphor and the Cotton Seed Oil into a suitable flask, and apply a gentle heat, by means of a water bath, loosely stoppering the flask during the operation. Agitate from time to time until the Camphor is dissolved.

OLEATA. OLEATES

The official oleates are liquid preparations, made by dissolving metallic salts, or alkaloids in oleic acid. They are not assumed to be definite chemical compounds. Oleic acid has special advantages as a basis for administering external remedies, being

more readily absorbed than most of the fatty substances used in making ointments. Three oleates are official (U. S. P. 1890).

OLEATUM HYDRARGYRI

℞ Yellow Mercuric Oxide, thoroughly dried 5 gm.
Oleic acid 20 gm.

Introduce the oleic acid into a suitable vessel, (evaporating dish) and gradually add to it the Yellow Mercuric Oxide by sifting it upon the surface of the acid, and incorporate it by continuous stirring. Then set the mixture aside in a warm place, at a temperature not exceeding 40° C. and stir frequently, until the Oxide is dissolved.

INFUSA. INFUSIONS

Infusions are liquid preparations, made by treating vegetable substances with either hot or cold water. They are not *boiled*, though boiling water is often employed. Infusions are usually made in four ways: 1. By maceration. 2. By digestion. 3. By percolation. 4. By diluting fluid extracts. There are four official infusions (U. S. P. 1890). The following *general formula* is given by the U. S. P.

℞ The Substance coarsely comminuted 50 gm.
Boiling Water 1000 cc.
Water q. s. to make 1000 cc.

Put the substance into a suitable vessel provided with a cover, pour upon it the boiling water, cover the vessel tightly, and let it stand for half an hour. Then strain and pass enough water through the strainer to make the infusion measure 1000 cc.

INFUSUM DIGITALIS

℞ Digitalis, bruised 1.5 grams
Alcohol 10. cc.
Cinnamon Water 15. cc.
Boiling Water 50. cc.
Cold Water q. s. 100. cc.

Upon the Digitalis contained in a suitable vessel, pour the boiling water, and allow it to macerate until the mixture is cold. Then strain, add the Alcohol and Cinnamon water to the strained liquid, and pass enough Cold Water through the residue on the strainer to make the product measure 100 cc.

DECOCTA. DECOCTIONS

Decoctions are liquid preparations made by *boiling* vegetable substances with water. There are two official decoctions (U. S. P. 1890). A *general formula* given by the U. S. P. is :

℞	The Substance, coarsely comminuted	50 gm.
	Water q. s.	1000 cc.

Put the substance into a suitable vessel provided with a cover, pour upon it 1000 cc. of cold water, cover it well, and boil for fifteen minutes. Then let it cool to about 40° C., express, strain the expressed liquid, and pass enough cold water through the strainer to make the product measure 1000 cc.

DECOCTUM CETRARIAE

℞	Cetraria	5 gm.
	Water q. s.	100 cc.

Cover the Cetraria in a suitable vessel with 40 cc. of Cold Water, express after half an hour, and throw the liquid away. Then boil the Cetraria with 100 cc. of Water for half an hour, strain, and add enough Cold Water, through the strainer, to make the product, when cold, measure 100 cc.

EXERCISE XIX

TINCTURAE. TINCTURES

Tinctures are alcoholic solutions of medicinal substances, they differ from spirits in that the substances are non-volatile. (Except Tr. Iodi.) With but one exception, spirits are solutions of volatile substances. Tinctures may be prepared by percolation, maceration, solution or dilution. There are seventy-

two official tinctures (U. S. P. 1890) which may be classified according to the percentage of active constituents.

The majority of tinctures are made by percolation and a brief description is herewith given. "Percolation, or displacement, is the process whereby a powder contained in a suitable vessel is deprived of its soluble constituents by the descent of a solvent through it."—Remington.

The solvent, which is poured on the top of the powder, in passing downward exercises its solvent power on the successive layers of the powder until saturated, and is impelled downward by the combined force of its own gravity and that of the column of liquid above, minus the capillary force with which the powder tends to retain it. A *percotator* is a vessel with a porous diaphragm below, into which the drug, in the form of a powder, is introduced, and its soluble portions extracted by the descent of the solvent through it. The *menstruum* or solvent is the liquid poured on top of the powder. The liquid coming from the percolator, impregnated with the soluble principles of the drug is the *percotate*.

The first portion of the percolate is always more dense, more highly colored and contains the largest proportion of the soluble principles, because the first portion of menstrum, in its descent through the powder, has the first opportunity to come in contact with the largest proportion of the soluble principles, which are to be found in the finer dust scattered through the powder, and in the thoroughly disintegrated particles, which offer but slight resistance to the passage of the menstruum. When successfully conducted, the first portion of the percolate will be nearly saturated with the soluble constituents of the substance treated ; if the quantity of the menstruum be sufficient for its exhaustion, the last portion of the percolate will be destitute of color, odor and taste, other than that possessed by the menstruum itself.

The general rule in percolation is to moisten the powder. The reason for this is that most drugs are vegetable substances which in their natural state were moist. The process of desiccation has hardened and dried the tissues, so that they do not absorb moisture quickly, and when compressed, as they are when packed in a percolator, the resistance is still greater. If a dry powder is tightly packed in a glass percolator and water poured upon it, the water will penetrate the powder but a short distance. Its further passage is prevented by the particles which are immediately in contact with the water, which have become swollen to such a degree that they press tightly against the sides of the percolator, and thus entirely overcome the gravitating force and penetrating power of the water. If, on the other hand, the powder is moistened with sufficient water to satisfy its tendency to swell, *before it is packed* in the percolator, the addition of water is followed by its slow percolation through the mass without stoppage.

A moist powder like a moist sponge, greedily absorbs moisture, but a dry powder, like a dry sponge, repels attempts to moisten it.

Care should be exercised in packing the percolator. It should be packed in layers, each succeeding layer, according to directions, should be packed "moderately" or "firmly," as the case may be, using the same de-

gree of pressure with each layer. If packed too firmly, the menstruum will not pass through readily ; if not packed firmly enough the menstruum will pass through too quickly and the full strength of the drug will not be obtained ; if packed unevenly the menstruum will pass readily through one side of the mass and not come in contact with the remainder at all. The menstruum should descend uniformly and slowly through the drug.

Before the drug is introduced in the percolator, a small piece of absorbent cotton, moistened with the menstruum, should be placed in the neck of the percolator. The cork with its glass tube should be adjusted. The rate of flow may he regulated by the proper adjustment of the tube in the cork, and should not, in most cases, exceed one drop per second. If it is desired to stop the process temporarily this may be easily accomplished by drawing the tube further into the cork so that the orifice is closed. Figures 1 and 2.

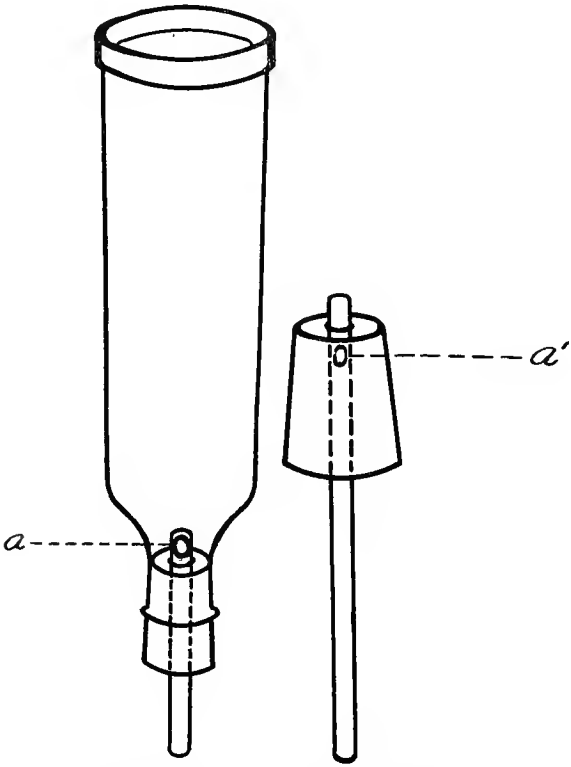

FIG. 1 FIG. 2

In fig. 1, the orifice *a* is above the stopper to allow the liquid to percolate through the tube into the receiver. In fig. 2, the tube is pulled down so that the orifice *a* is within the stopper thereby shutting off the flow of liquid.

The bottle which receives the percolate should be graduated and the process discontinued when the proper amount is obtained. The bottle should be thoroughly clean and if not dry when ready to use should be rinsed with a small amount of the menstruum.

TINCTURA IODI

℞			
	Iodine		7 gm.
	Alcohol	q. s.	100 cc.

Place the Iodine in a 4 oz. bottle and add the Alcohol. The Iodine will dissolve slowly.

TINCTURA ZINGIBERIS

℞			
	Ginger, in No. 40 powder		20 gm.
	Alcohol	q. s.	100 cc.

Moisten the Ginger with 5 cc of Alcohol, and macerate for 24 hours; then pack it firmly in a cylindrical percolator, and gradually pour alcohol upon it, until 100 cc. of tincture are obtained.

VINA. (WINES)

Wines are liquid preparations containing the soluble principles of medicinal substances dissolved in wine. They differ from tinctures merely in the character of the menstruum. Of the ten official wines (U. S. P. 1890), two are not medicated, four are made by solution or admixture, two by maceration, and two by percolation.

VINUM IPECACUANHÆ

℞		
	Fluid Extract of Ipecac	5 cc.
	Alcohol	5 cc.
	White Wine	40 cc.

Mix them. Set the mixture aside for a few days, then filter.

EXTRACTA FLUIDA. (FLUID EXTRACTS)

Fluid Extracts are liquid Alcoholic preparations of nearly uniform and definite strength, made by percolating drugs with menstrua, and concentrating a portion of the percolate, so that in each case a cubic centimeter represents the medicinal virtue of

one gram of the drug ; they are mostly concentrated tinctures. The special feature of fluid extracts is that they represent the activity of the drug, volume for weight, or one minim of the fluid extract always represents about one grain of the drug from which it is prepared. They possess the advantage over tinctures that they are uniform, definite and concentrated. Tinctures on the other hand possess the advantage that they may be added in small proportions to aqueous preparations without serious precipitation. In some cases, also, the alcoholic menstrum of the tincture is to be desired. Fluid extracts are prepared by (1) Percolation with partial evaporation (official). (2) Percolation with incomplete exhaustion. (3) Repercolation. (4) Maceration with hydraulic pressure. (5) Vacuum maceration with percolation. There are eighty-eight official fluid extracts, (U. S. P. 1890) which may be arranged in classes according to the alcoholic strength of their menstrua.

EXTRACTUM BELLADONNÆ RADICIS FLUIDUM

℞	Belladonna Root, in No. 60 powder		50 gm.
	Alcohol		
	Water, each,	q. s.	50 cc.

Mix 40 cc. of Alcohol with 10 cc. of Water, and, having moistened the powder with 17.5 cc. of the mixture, pack it firmly in a cylindrical percolator ; then add enough menstruum to saturate the powder and leave a stratum above it. When the liquid begins to drop from the percolator, close the lower orifice, and, having closely covered the percolator, macerate for forty-eight hours. Then allow the percolation to proceed, gradually adding menstruum, using the same proportions of Alcohol and Water as before, until the belladonna root is exhausted. Reserve the first 45 cc. of the percolate, and evaporate the remainder, at a temperature not exceeding 50° C., to a soft extract ; dissolve this in the reserved portion, and add enough menstruum to make the fluid extract measure 50 cc.

EXTRACTUM PILOCARPI FLUIDUM

℞	Pilocarpus, in No. 40 powder		50. gm.
	Diluted Alcohol	q. s.	50. cc.

Moisten the powder with 17.5 cc. of diluted Alcohol, and pack it firmly in a cylindrical percolator ; then add enough diluted Alcohol to saturate the powder and leave a stratum above it. When the liquid begins to drop from the percolator, close the lower orifice, and, having closely covered the percolator, macerate for forty-eight hours. Then allow the percolation to proceed gradually adding Diluted Alcohol, until the Pilocarpus is exhausted. Reserve the first 42.5 cc. of the percolate, and evaporate the remainder, at a temperature not exceeding 50° C., to a soft extract ; dissolve this in the reserved portion, and add enough Diluted Alcohol to make the fluid extract measure 50 cc.

EXERCISE XX

OLEORESINÆ. (OLEORESINS)

The oleoresins are official liquid preparations, consisting principally of natural oils and resins extracted from vegetable substances of percolation with ethylic ether. They were formerly classed with fluid extracts, but they differ essentially from the latter : 1. They do not bear any uniform relation to the drug as the fluid extracts do, of gram to cubic centimeter,—the yield of oleoresin obtained from the drug varying according to the proportion of oil and resin naturally present. The menstruum used, ethylic ether, extracts the principles which are often insoluble in Alcohol or in Diluted Alcohol, and *vice versa*. 3. They are without exception the most concentrated liquid preparations of the drugs that are produced. Six oleoresins are official (U. S. P. 1890).

OLEORESINA ASPIDII

℞ Aspidium, recently reduced to No. 60 powder — 50. gm.
Ether q. s.

Put the Aspidium, into a cylindrical glass percolator, provided with a stop-cock, and arranged with cover and receptacle suitable for volatile liquids. Press the drug firmly, and percolate

slowly with Ether, added in successive portions, until the drug is exhausted. Recover the greater part of the Ether from the percolate by distillation on a water bath, and, having transferred the residue to a capsule, allow the remaining Ether to evaporate spontaneously. (The product is usually about 6 gm.) Keep the oleoresin in a well stoppered bottle.

ACETA. (VINEGARS)

Medicated vinegars are solutions of the active principles of drugs in diluted acetic acid, the latter being chosen as a menstruum because acetic acid is not only a good solvent, but also possesses antiseptic properties. It also produces soluble salts with the alkaloidal principles existing in plants. The official dilute acetic acid contains 6% by weight of absolute acetic acid. There are two official vinegars (U. S. P. 1890). *Acetum Opii*, *Acetum Scillæ*.

ACETUM SCILLAE

℞	Squill in No. 30 powder		5 gm.
	Diluted Acetic Acid	q. s.	50 cc.

Macerate the Squill with 45 cc. of Diluted Acetic Acid during seven days, frequently stirring; then strain through muslin, and wash the mass on the strainer with enough Diluted Acetic Acid, until the strained liquid measures 50 cc. Finally filter.

EXTRACTA. (EXTRACTS)

Extracts are solid or semi-solid preparations produced by evaporating solutions of vegetable principles. The solutions may be made by percolating the drug with water, alcohol, diluted alcohol of various strengths, ether, diluted acetic acid or diluted solution of ammonia, and the extracts made from such percolate are termed respectively, *aqueous*, *alcoholic*, *hydro-alcoholic*, *ethereal*, *acetic* or *ammoniated* extracts. In addition to this, the juices of fresh plants, extracted by contusion and expression are evaporated, and such extracts are frequently called *Inspissated juices*. There are thirty-three official extracts. (U. S. P. 1890.)

EXTRACTUM DIGITALIS

℞	Digitalis, in No. 60 powder		50 gm.
	Alcohol,		
	Water, each.	q. s.	

Mix 30 cc. of Alcohol with 15 cc. of Water, and having moistened the powder with 20 cc. of the mixture, pack it firmly in a cylindrical percolator; then add enough menstruum to saturate the powder and leave a stratum above it. When the liquid begins to drop from the percolator close the lower orifice, and, having closely covered the percolator, macerate for forty-eight hours. Then allow the percolation to proceed, gradually adding menstruum, using the same proportions of Alcohol and Water as before, until 150 cc. of tincture are obtained, or the Digitalis is exhausted. Distil off the Alcohol from the tincture by means of a water bath, and evaporate the residue, on a water bath at a temperature not exceeding 50°C., to a pilular consistence.

EXTRACTUM GENTIANÆ

℞ Gentian, in No. 20 powder 50 gm.
Water, q. s.

Moisten the powder with 20 cc. of Water, and let it macerate for twenty-four hours; then pack it in a conical percolator, and gradually pour water upon it until the infusion passes but slightly imbued with the properties of the gentian. Reduce the liquid to three-fourths of its bulk by boiling, and strain; then, by means of a water bath, evaporate to a pilular consistence.

EXERCISE XXI

RESINÆ. (RESINS)

Official resins are solid preparations, consisting principally of the resinous principles from vegetable bodies, prepared by precipitating them from their alcoholic solution with water. Resins are stronger than alcoholic extracts. There are five official resins (U. S. P. 1890).

RESINA JALAPAE

℞ Jalap, in No. 60 powder 50 gm.
Alcohol,
Water, each, q. s.

Moisten the powder with 15 cc. of Alcohol, and pack it firmly in a cylindrical percolator; then add enough Alcohol to saturate the powder and leave a stratum above it. When the liquid begins to drop from the percolator, close the lower orifice, and having closely covered the percolator, macerate for forty-eight hours. Then allow the percolation to proceed, gradually adding alcohol, until 125 cc. of tincture are obtained, or until the tincture ceases to produce more than a slight turbidity when dropped into water. Distil off the alcohol by means of a water bath until the tincture is reduced to 20 gm., and add the latter, with constant stirring, to 450 cc. of water. When the precipitate has subsided, decant the supernatant liquid, and wash the precipitate twice, by decantation, with fresh portions of water. Place it upon a strainer, and, having pressed out the liquid, dry the resin with a gentle heat, stirring occasionally until the moisture has evaporated.

PULVERES. (POWDERS)

Powders furnish a convenient mode of administering certain medicines. Pulverization facilitates the solution or the extraction of the soluble principles of a substance by extending the surface exposed to the action of the solvent. There are nine official powders (U. S. P. 1890).

PULVIS IPECACUANHAE ET OPII. (DOVER'S POWDER)

℞	Ipecac, in No. 60 powder	1. gm.
	Powdered Opium	1. gm.
	Sugar of Milk in No. 30 powder	8. gm.

Rub them together into a very fine powder.

TRITURATIONES. (TRITURATIONS)

A small class of powders introduced into the pharmacopœia, for the purpose of fixing a definite relation between the active ingredient and the diluent. There is but one official trituration (U. S. P. 1890).

TRITURATIO ELATERINI

℞	Elaterin	1. gm.
	Sugar of Milk, in moderately fine powder	9. gm.

Mix them thoroughly by trituration.

MASSAE. (MASSES)

Masses for pills are official. They are usually kept in bulk by pharmacists and permanent preparations. There are three official masses (U. S. P. 1890.)

MASSA HYDRARGYRI. (BLUE MASS, BLUE PILL)

℞		
	Mercury	16.5 gm.
	Glycyrrhiza, in No. 60 powder	2.5 gm.
	Althea, in No. 60 powder	12.5 gm.
	Glycerin	1.5 gm.
	Honey of Rose	17. gm.

Triturate the Mercury with the Honey of Rose and Glycerin until it is extinguished. Then gradually add the Glycyrrhiza and Althea, and continue the trituration until the globules of Mercury are no longer visible under a lens magnifying at least ten diameters.

EXERCISE XXII

CONFECTIONES. (CONFECTIONS)

Confections are saccharine, soft solids, in which one or more medicinal substances are incorporated with the object of affording an agreeable form for their administration, and a convenient method for their preservation. Under the old names of *conserves* and *electuaries*, these preparations have been in use for centuries. The term *electuary* is still used in veterinary medicine. Only two confections are official. (U. S. P. 1890).

CONFECTIO ROSAE

℞		
	Red Rose, in No. 60 powder	4 gm.
	Sugar, in fine powder	32 gm.
	Clarified Honey	6 gm.
	Stronger Rose Water	8 cc.

Rub the Red Rose with the Stronger Rose Water previously heated to 65°C., then gradually add the Sugar and Honey, and beat the whole together until a uniform mass results.

PILULAE (PILLS)

Pills are small, solid bodies, of a globular, ovoid or lenticular shape, which are intended to be swallowed, and thereby produce medicinal action. There are fifteen official pills. (U. S. P. 1890)

PILULAE ALOES

℞	Purified Aloes in fine powder	1.3 gm.
	Soap in fine powder	1.3 gm.
	Water q. s. to make 10 pills (about 6 minims)	

Beat the powders together in a sufficient quantity of water, so as to form a mass, and divide it into 10 pills.

PILULAE RHEI

℞	Rhubarb, in No. 60 powder	2. gm.
	Soap, in fine powder	0.6 gm.
	Water q. s. to make 10 pills (about 5 minims.)	

Beat the powders together with water, so as to form a mass, to be divided into 10 pills.

TROCHISCI. (TROCHES)

Troches, or Lozenges, are solid, discoid, or cylindrical masses, consisting chiefly of medicinal powders, sugar and mucilage. Very powerful or disagreeable remedies are not administered in this way. They are prepared by making the ingredients into a mass which is rolled into a thin sheet, and cut into proper shape with a lozenge cutter. The U. S. P. 1890 recognizes fifteen formulae for troches.

TROCHISCI MENTHÆ PIPERITÆ

℞	Oil of Peppermint	0.5 cc.
	Sugar in fine powder	40. gm.
	Mucilage of Tragacanth, q. s.	

Rub the oil of Peppermint and the Sugar together until they are thoroughly mixed ; then, with mucilage of tragacanth, form a mass, to be divided into 50 troches.

EXERCISE XXIII

CERATA. (CERATES)

Cerates are unctuous substances of such consistence that they may be easily spread, at ordinary temperatures, upon muslin or similar material with a spatula, and yet not so soft as to liquefy and run when applied to the skin. They are called cerates because of the presence of wax (*Cera*). There are six official cerates (U. S. P. 1890).

CERATUM CAMPHORÆ

℞		
	Camphor Liniment	2.5 gm.
	White Wax	7.5 gm.
	Lard	15. gm.

Melt the White Wax and Lard with the aid of a gentle heat; then add the Camphor Liniment, and stir the mixture occasionally, until it has become cold.

UNGUENTA. (OINTMENTS)

Ointments are fatty preparations, softer than cerates, intended to be applied to the skin by inunction. The medicating ingredients are combined with a basis of lard, petrolatum or similar substance. There are 23 official ointments (U. S. P. 1890).

ADEPS BENZOINATUS. BENZOINATED LARD

℞		
	Benzoin	4. gm.
	Lard	200. gm.

Melt the Lard over a water bath. Tie the Benzoin in a piece of coarse muslin, suspend it in the melted Lard, stirring frequently. Cover the vessel and continue the heat for an hour, not allowing the temperature to rise above 60° C. Remove the Benzoin and stir the Lard until it becomes cold.

UNGUENTUM HYDRARGYRI BINIODIDI ET CANTHARIDIS

(UNOFFICIAL)

℞		
	Biniodide of Mercury	10. gm.
	Powdered Cantharides	10. gm.
	Benzoinated Lard	50. gm.

Triturate the Biniodide of Mercury in a mortar until all small lumps are reduced to a fine powder, add the Powdered Cantharides, a little at a time, and mix the two substances thoroughly. Finally add the Benzoinated Lard gradually and rub in the mortar until completely mixed.

UNGUENTUM SULPHURIS

℞	Washed Sulphur	7.5 gm.
	Benzoinated Lard	17.5 gm.

Rub the Washed Sulphur with Benzoinated Lard, gradually added, until they are thoroughly mixed.

UNGUENTUM ZINCI OXIDI

℞	Zinc Oxide	5. gm.
	Benzoinated Lard	20. gm.

Sift the Zinc Oxide through a No. 20 sieve, upon the surface of the Benzoinated Lard, previously melted, and incorporate it by stirring, which is to be continued until the ointment is cool.

UNGUENTUM ACIDI TANNICI

℞	Tannic Acid in fine powder	5. gm.
	Benzoinated Lard	20. gm.

Rub the Tannic Acid with the Benzoinated Lard, gradually added, until they are thoroughly mixed, avoiding the use of iron utensils.

EXERCISE XXIV

EMPLASTRA. (PLASTERS)

Plasters are substances intended for external application, of such consistence that they adhere to the skin, and require the aid of heat in spreading them. There are thirteen official plasters. (U. S. P. 1890).

EMPLASTRUM PICIS BURGUNDICÆ

℞	Burgundy Pitch	40. gm.
	Olive Oil	2.5 gm.
	Yellow Wax	7.5 gm.

Melt together the Burgundy Pitch and Yellow Wax, then incorporate the olive oil, and stir constantly, until the mass thickens on cooling.

CHARTAE. (PAPERS)

Papers are preparations intended principally for external application, made either by saturating paper with medicinal substances, or by applying the latter to the surface of the paper by the addition of some adhesive liquid.

Only two papers are official, (U. S. P. 1890) Potass. Nitrate paper and Mustard paper.

CHARTA POTASSII NITRATIS

Potassium Nitrate	1 gm.
Distilled Water	4 cc.

Dissolve the Potassium Nitrate in the Water. Soak strips of of unsized white paper in the solution and then dry them. The paper should be kept in well closed bottles. This preparation is used in asthma by burning the paper and inhaling the fumes.

SUPPOSITORIA. (SUPPOSITORIES)

Suppositories are solid bodies intended to be introduced into the rectum, urethra or vagina to produce medicinal action. Their consistence should be such that, whilst they will retain their shape at ordinary temperatures, they will readily melt or soften at the temperature of the body. The only official suppositories are those made with glycerin. (U. S. P. 1890).

SUPPOSITORIA GLYCERINI

℞	Glycerin	30. gm.
	Sodium Carbonate	1.5 gm.
	Stearic Acid	2.5 gm.

To make 5 rectal suppositories.

Dissolve the Sodium Carbonate in the Glycyerin in a capsule on a water bath ; then add the Stearic Acid, and heat carefully until this is dissolved, and the escape of carbonic acid gas has ceased. Then pour the melted mass into suitable moulds, remove

the suppositories when they are cold, and wrap each in tin foil. These suppositories should be freshly prepared when required.

EXERCISE XXV

MISCELLANEOUS

CHLORAL *with* CAMPHOR

℞		
	Camphor	5. gm.
	Chloral	5. gm.

Triturate thoroughly in a warm mortar. Filter if necessary. Preserve in a well stoppered bottle.

BORATED COTTON

Absorbent Cotton	q. s.
Boric Acid	1. gm.
Water	6. cc.

Dissolve the Boric Acid in the Water at a temperature of 60° C. Saturate the Cotton with the solution. Press it and dry it.

SALICYLATED COTTON

℞		
	Absorbent Cotton	5. gm.
	Salicylic Acid	0.5 gm.
	Alcohol	5. cc.

Dissolve the Salicylic Acid in the Alcohol and saturate the Cotton with the liquid. Press out the superfluous liquid and dry.

STYPTIC COTTON

℞		
	Solution of Ferric Chloride	5 cc.
	Glycerin	1 cc.
	Water	4 cc.
	Absorbent Cotton q. s.	

Mix the liquids and add enough Cotton so that it shall be completely immersed when pressed slightly. Let the cotton remain in the liquid for one hour, then remove and press it until it has been brought to *twice* its original weight. Spread in thin layers, in a warm place, protected from the dust and light and when dry transfer to well-closed receptacles.

CAUTERIZING PENCILS OF COPPER SULPHATE

℞		
	Copper Sulphate	8 gm.
	Sodium Borate	2 gm.

Triturate together in a warm mortar ; the mass becomes soft from the liberation of water of crystallization and it may be readily rolled into sticks. If it becomes too dry a little water may be added.